

STRUCTURAL FLOOR ANALYSIS  
FOR  
ADDITIONAL STORAGE LOADS ON SEVENTH FLOOR  
AT  
517 GOLD AVENUE S.W.  
BUILDING NO. NM0024ZZ  
ALBUQUERQUE, NEW MEXICO  
PROJECT NO. ZTX00110

FOR

GENERAL SERVICES ADMINISTRATION  
DESIGN AND CONSTRUCTION DIVISION  
FORT WORTH, TEXAS

BY

ROBERT W. CROSSNO, P.E.

RANDY HOLT & ASSOCIATES, INC.  
CONSULTING ENGINEERS  
7920 MOUNTAIN ROAD N.E.  
ALBUQUERQUE, NEW MEXICO

JUNE 1990

## INTRODUCTION

The structural capacity of the existing seventh floor structure to support file storage was investigated. This floor is a conventionally reinforced two-way concrete slab system with drop panels at the columns. File storage loads were determined based upon the calculated weights of the existing drawers and shelves when full plus an allowance for pedestrian traffic.

## OBSERVATIONS

The existing file room is L-shaped in plan with the long leg 13'-6" wide along the east side of building Grid Line F from Grid Line 2 to Grid Line 4 and the short leg 16'-0" wide along the south side of building Grid Line 2 from Grid Line F to 13'-6" west of Grid Line F. It now contains 15 flat file stacks, 33 file drawer stacks, 15 book shelves, a desk, a refrigerator and a microfiche reader.

Flat file stacks consist of four 20 gage steel units, each with five drawers. There is one three unit stack. File drawer stacks consist of five drawers of 20 gage steel. The typical file drawer is letter size, but a small number are legal size. File drawer stacks containing survey books are four drawers high. Book shelves are 6'-6" high with 6 shelves of 16 gage steel.

## ANALYSIS

Analysis was based on the structural drawings of the building, dated 1956, and the technical specifications for Concrete and Cement Work for the building. Analysis used equivalent frames in accordance with American Concrete Institute Building Code Requirements for Reinforced Concrete (ACI 318-89).

The specifications show 3000 psi concrete for floor slabs and walls and 3750 psi concrete for columns. The specifications allow any grade of billet grade reinforcing steel except structural grade (33,000 psi yield).

The other types of billet grade reinforcing available at the time were intermediate grade (40,000 psi yield) and hard grade (50,000 psi yield). The drawings do not indicate the type of reinforcing used. However, the amounts of reinforcing shown on the drawings are consistent with the use of hard grade reinforcing for 80 psf live load indicated on the drawings and the building code requirements applicable at the time of design (ACI 318-56). Therefore, 50,000 psi reinforcing steel was considered for this analysis. However, the conclusions drawn from such an assumption must be considered in light of the possibility that the lesser intermediate grade of reinforcing was used.

Loading at the file storage room was based on book shelves and file drawers packed with paper at medium density (58 pcf), flat files packed with paper at loose density (45 psf) and a 20 psf live load allowance for traffic between the files.

Analysis of the floor considered the north-south equivalent frame along Grid Line F spanning four bays and the east-west equivalent frame along Grid Line 2 spanning seven bays. This analysis showed that of 18 of the 80 locations for which imposed bending moments and allowable bending moments were compared, the imposed moment was greater than the Building Code allowed. As was expected, these

## ANALYSIS (Continued)

overflexed areas occurred in the region of the greater file storage loads with the greatest flexural overload (143% of the Code allowable moment) occurring in the north-south, four bay equivalent frame in the column strip at line 3. The greatest flexural overload in the east-west, seven bay equivalent frame occurred in the column strip midway between Grids F and G; the imposed moment was 124% of the Code allowable.

The increased loads at the file storage result in flexure great enough to exceed the cracking moment of the slab. This results in immediate, not long term, deflections of up to 0.956 inches or 1/313 of the span.

Analysis of the shear capacity indicates the concrete is adequate to resist the increased loads for both beam shear and two way (punching) shear.

## CONCLUSION

The file storage loads exceed the original design live load capacity of 80 psf and impose flexure greater than the structural allowable that is likely to lead to excessive deflections and, eventually, failure of the slab characterized by sagging and cracking of floor, ceiling below and supported partitions.

## RECOMMENDATIONS

We recommend that the file storage room be increased in area and that the existing files be spread out evenly without an increase in size or number of files, to fill the new space or that a portion of the files be removed.

We recommend that the storage room be increased to 30'x51'-2" with ABSOLUTELY NO ADDITIONAL FILING UNITS BEING STORED in that area and that the filing units be spaced apart. Alternately, we recommend that 28% of each type of unit be removed, resulting in no more than 10 flat file stacks of four 5-drawer units each, 23 filing drawer stacks of 5 drawers each and 10 bookshelves.

If there are questions about this report or the structural analysis, please feel free to contact us. Attached, please find copies of the calculations and the proposed floor plan.

Job Title: FLOOR ANALYSIS GOLD By LC Date 15 JUNE 90 Job no. 9043  
Subject: TABLE OF CONTENTS Checked      Sheet 1 of 1

ITEM

PHILOSOPHY, LOADS

PLAN

N-3 FOUR-BAY EQUIVALENT FRAME

N-3 STRIP MOMENTS

E-W SEVEN-BAY EQUIVALENT FRAME

E-W STRIP MOMENTS

SHEAR

LOAD REDUCTION REQUIRED

DEFLECTIONS

PAGE

1

2

3 - 13

14 - 17

18 - 24

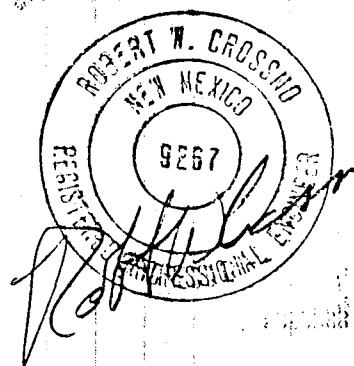
25 - 27

28

29

30 - 32

COMPUTER DATA FOLLOWS IN . . . APPENDIX



ANALYZE THE EXISTING 7TH FLOOR STRUCTURE TO DETERMINE ITS CAPACITY TO SUPPORT A FILE ROOM ALONGSIDE BAYS LIKE "F". IF EXISTING STRUCTURE WILL NOT ACCOMMODATE SUPPORT THE LOADS, DETERMINE AN ALTERNATIVE LAYOUT FOR THE ROOM THAT IS ACCEPTABLE.

EXISTING STRUCTURE HAS 3150<sup>PSI</sup> CONCRETE COLUMNS AND 3000<sup>PSI</sup> CONCRETE SLABS, 50,000<sup>PSI</sup> REINFORCING STEEL. SLAB IS 8" THICK. COLUMNS ARE SPACED 25'-0" EACH DIRECTION. DROP PANELS AT EACH COLUMN ARE 12" THICK (4" BELOW BOTTOM OF SLAB). PLY 8'-4" SQUARE. COLUMNS HAVE "LANDSHADE" CHECK HEADS. THERE ARE FOUR BAYS NORTH-SOUTH AND TWELVE BAYS EAST-WEST.

THE FILE ROOM EXTENDS OVER THE TWO MIDDLE BAYS IN THE FOUR-BAY DIRECTION. THE FILE ROOM EXTENDS FROM THE WEST SIDE OF THE COLUMNS TO THE MIDDLE OF THE MIDDLE BAY TO THE EAST AND JUTS 13' TO THE WEST AT 15' AT THE NORTH END. THE DESIGN ASKING WOULD LIKE 1000<sup>PSF</sup> LIVE LOAD.

BUILDING WAS ORIGINALLY DESIGNED FOR 30<sup>PSF</sup> L.L.

#### FLOOR DEAD LOADS:

FLOOR FINISH:	1.5 PSF
2" PLATE:	100 PSF
PRAEFERCEMENT:	2 PSF
SUSP. CEILING:	1.8 PSF
MFL. ELEC. & MECH.:	1.5 PSF

$$DL = 112.8 \text{ PSF}$$

$$SAM 115 \text{ PSF}$$

#### WALL DEAD LOADS:

STEEL STUDS:	0.5 PSF
2-1/2" GYP. BD:	4.4 PSF

$$DL = \frac{4.4 \text{ PSF}}{4.9 \text{ PSF}}$$

$$4.9 \text{ PSF} \times 9' = 44 \text{ PLF SAM } 50 \text{ PLF}$$

Randy Holt & Associates, Inc.  
CONSULTING ENGINEERS

7920 MOUNTAIN ROAD, N.E.  
ALBUQUERQUE, NEW MEXICO 87110  
(505) 265-5823

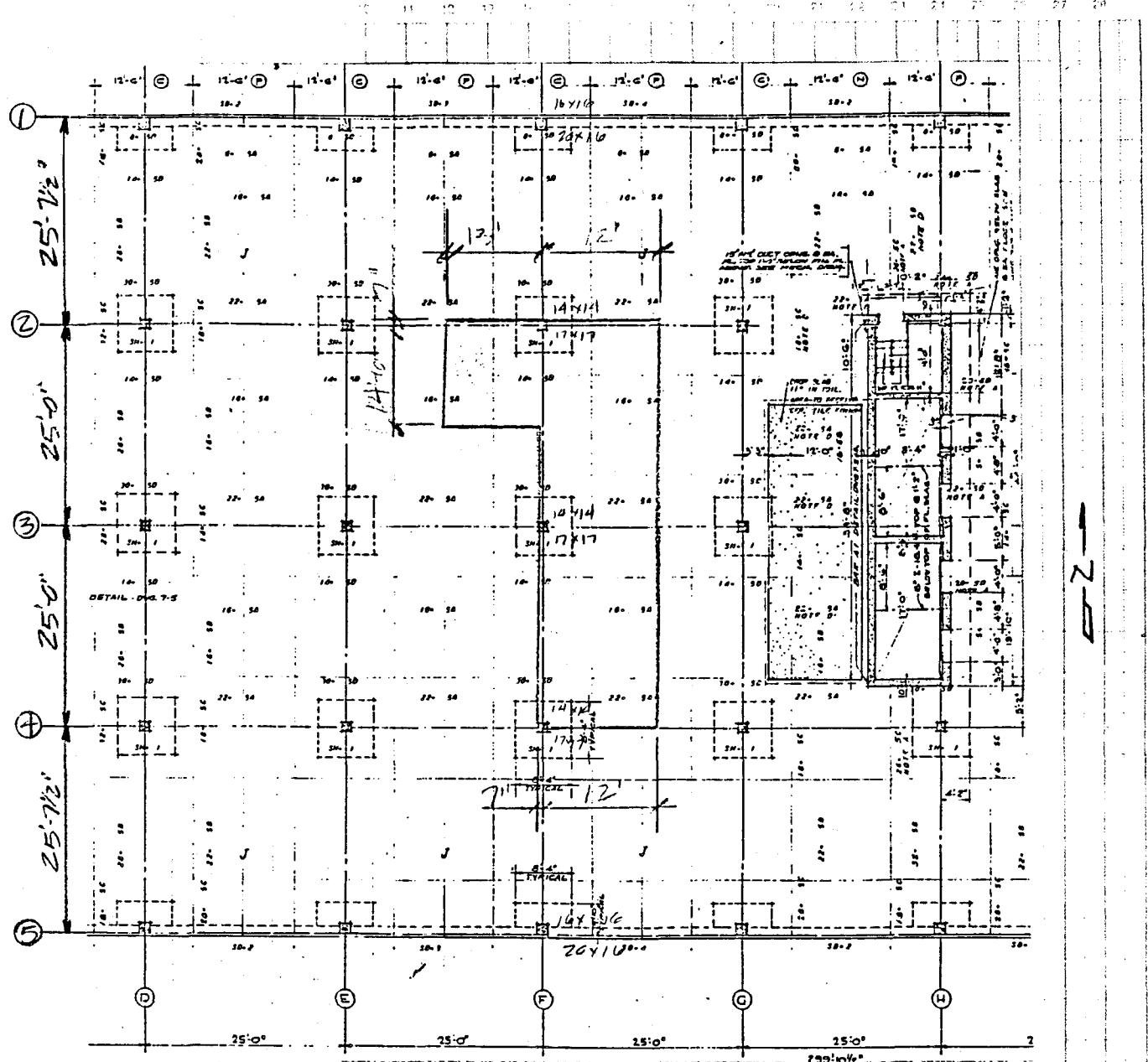
Job Title FLOOR ANAL. C576AD By PK Date 5-21-90 Job no. 9043

Subject

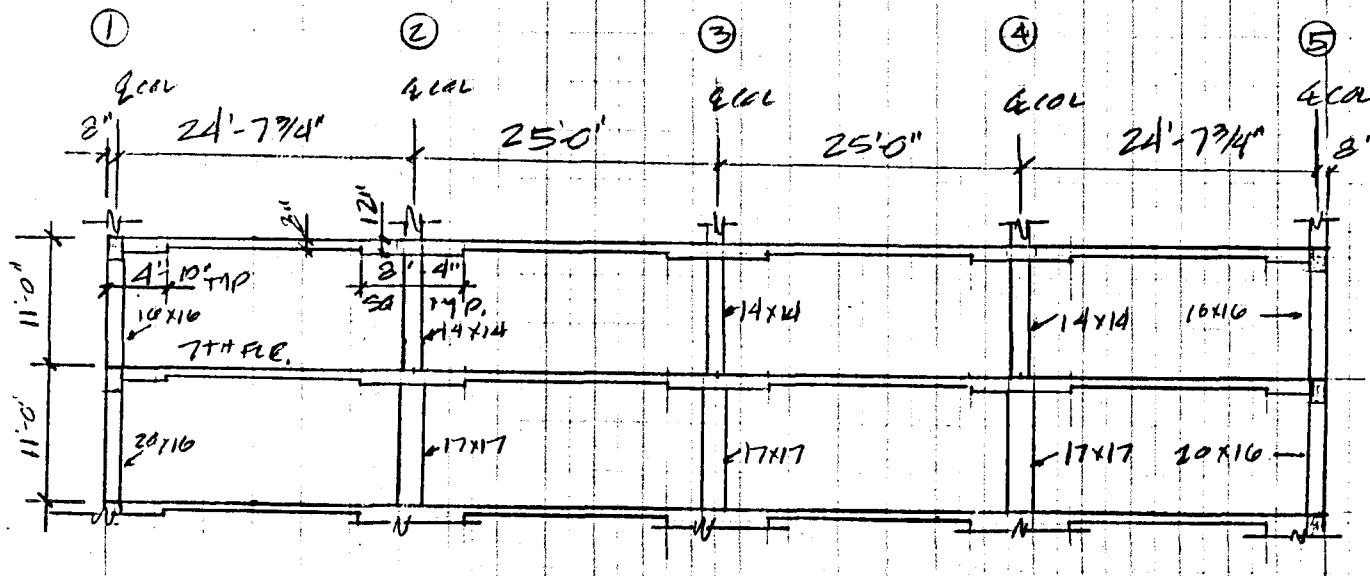
PLAN

Checked

Sheet 2 of 32



SIMPLIFIED THE EQUIVALENT FRAME ALONG GRID E:



GRID E MOMENTS OF INERTIA & STIFFNESS CORRECTIONS:

$$\text{SLAB-BEAM P/W DROPS: } I_1 = \frac{1}{12}(25' \times 12\%) (8")^3 = 12,800 \text{ in}^4$$

SLAB-BEAM DROPPINEL:

$$I_2 = \frac{(8.33')(4)(2') + (25')(8')(8")}{(8.33')(4) + (25')(8')} = 7.143"$$

$$\begin{aligned} I_2 &= \frac{1}{12}(8.33' \times 12\%)(4")^3 + \frac{1}{12}(25' \times 12\%)(8")^3 \\ &\quad + (8.33' \times 12\%)(4") \times (7.143" - 2")^2 + (25' \times 12\%)(8") \times (8" - 7.143")^2 \\ &= 533.3 \text{ in}^4 + 12,800 \text{ in}^4 + 10,580 \text{ in}^4 + 1763 \text{ in}^4 \\ &= 25,676 \text{ in}^4 \end{aligned}$$

SLAB-BEAM WITHIN COLUMN:

AT INTERIOR COLUMNS,  $C_2 = 17"$

$$I_3 = I_2 / (1 - C_2/l_2)^2 = 25,676 \text{ in}^4 / \left(1 - \frac{17"}{25' \times 12\%}\right)^2 = 28,853 \text{ in}^4$$

AT EXTERIOR COLUMNS,  $C_2 = 20"$

$$I_3 = 25,676 \text{ in}^4 / \left(1 - \frac{20"}{25' \times 12\%}\right)^2 = 27,510 \text{ in}^4$$

5-25-90

Subject EQUIVALENT FRAMES

Checked

Sheet 1 of 32

INTERIOR COLUMNS ABOVE FLOOR:

$$I_c = \frac{1}{12}(14\text{ in})(14\text{ in})^3 = 3201 \text{ in}^4$$

EXTERIOR COLUMNS ABOVE FLOOR:

$$I_c = \frac{1}{12}(16\text{ in})(16\text{ in})^3 = 5440 \text{ in}^4$$

INTERIOR COLUMNS BELOW DROP PANELS:

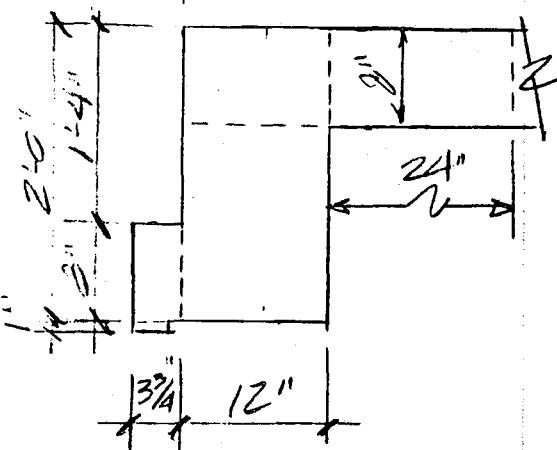
$$I_c = \frac{1}{12}(17\text{ in})(17\text{ in})^3 = 6960 \text{ in}^4$$

EXTERIOR COLUMNS BELOW DROP PANELS:

$$I_c = \frac{1}{12}(20\text{ in})(16\text{ in})^3 = 6827 \text{ in}^4$$

AT COLUMNS WITHIN SLABS & DROP PANELS,  $I = \infty$

SPANDREL BEAM TORSIONAL CORRECTION:



$$C = \left[ 1 - 0.63 \left( \frac{12\text{ in}}{24\text{ in}} \right) \right] \frac{(12\text{ in})^3(24\text{ in})}{3} + \left[ 1 - 0.63 \left( \frac{33/4\text{ in}}{8\text{ in}} \right) \right] \frac{(33/4\text{ in})^3(8\text{ in})}{3} + \left[ 1 - 0.63 \left( \frac{8\text{ in}}{24\text{ in}} \right) \right] \frac{(8\text{ in})^3(24\text{ in})}{3} = 741.09 + 97.1 + 3235.8 = 12,200 \text{ in}^4$$

$$C = \left[ 1 - 0.63 \left( \frac{12\text{ in}}{16\text{ in}} \right) \right] \frac{(12\text{ in})^3(16\text{ in})}{3} + \left[ 1 - 0.63 \left( \frac{33/4\text{ in}}{8\text{ in}} \right) \right] \frac{(33/4\text{ in})^3(8\text{ in})}{3} + \left[ 1 - 0.63 \left( \frac{8\text{ in}}{36\text{ in}} \right) \right] \frac{(8\text{ in})^3(36\text{ in})}{3} = 4861.4 + 97.1 + 5283.8 = 10,224 \text{ in}^4$$

ACI (13-7) →

$$\rightarrow E_{sp} = 57/\sqrt{3000} = 3122 \text{ kpsi}$$

$$K_t = \frac{9(3122 \text{ kpsi})(12800 \text{ in}^4)}{(25' \times 12\text{ in}) \left[ 1 - (16/25 \times 2) \right]^3} = 1,413,150 \text{ kN/RAD} \quad \text{ACI (13-6)}$$

INTERIOR SLAB REINFORCEMENT CORRECTION:

$$c = \left[ 1 - 0.163 \left( \frac{8''}{17''} \right) \right] \frac{(8'')^3 (17'')}{25} = 2041 \text{ in}^4 \quad \text{ACI (13-7)}$$

$$K_t = \frac{2 \times 9(322 \text{ ksi})(2041 \text{ in}^4)}{(25' \times 12''/\text{in}) [1 - (17''/25' \times 12''/\text{in})]^3} = 455,400 \text{ kip/in/RAD}$$

COLUMN STIFFNESSES:

$$H/H_C = 11'/10' = 1.10$$

$$t_a = 7.143'' \quad t_b = 12'' - 7.143'' = 4.857''$$

$$\frac{t_a}{t_b} = \frac{7.143}{4.857} = 1.47$$

$$K_{AB} = 5.23$$

$$E_{CC} = 5.7 \times 10^6 \text{ psi} = 34091 \text{ kip/in}$$

UPPER EXTERIOR COLUMNS:

$$K_C = 5.23 (34091 \text{ kip/in}) (3261 \text{ in}^4) / (11' \times 12''/\text{in}) = 755,400 \text{ kip/in/RAD}$$

COVER EXTERIOR COLUMNS:

$$K_C = 5.23 (34091 \text{ kip/in}) (6027 \text{ in}^4) / (11' \times 12''/\text{in}) = 944,300 \text{ kip/in/RAD}$$

UPPER INTERIOR COLUMNS:

$$K_C = 5.23 (34091 \text{ kip/in}) (3261 \text{ in}^4) / (11' \times 12''/\text{in}) = 442,800 \text{ kip/in/RAD}$$

CORNER INTERIOR COLUMNS:

$$K_C = 5.23 (34091 \text{ kip/in}) (6160 \text{ in}^4) / (11' \times 12''/\text{in}) = 962,700 \text{ kip/in/RAD}$$

S 75-90  
Job Title FLOOR ANAL 2517 GOLD By PC Date Job no. 90x13  
Subject EQUIVALENT FRAME Checked Sheet 6 of 32

EXTERIOR COLUMN STIFFNESSES CORRECTED FOR TORSION:

$$K_{ec} = \frac{(755,100 + 944,300)(1,413,500)}{755400 + 944,300 + 1413500} = 771,200 \text{ kN/rad}$$

CORRECTION FACTOR FOR EXTERIOR COLUMNS:

$$KF_e = \frac{771,200}{755400 + 944,300} = 0.4537$$

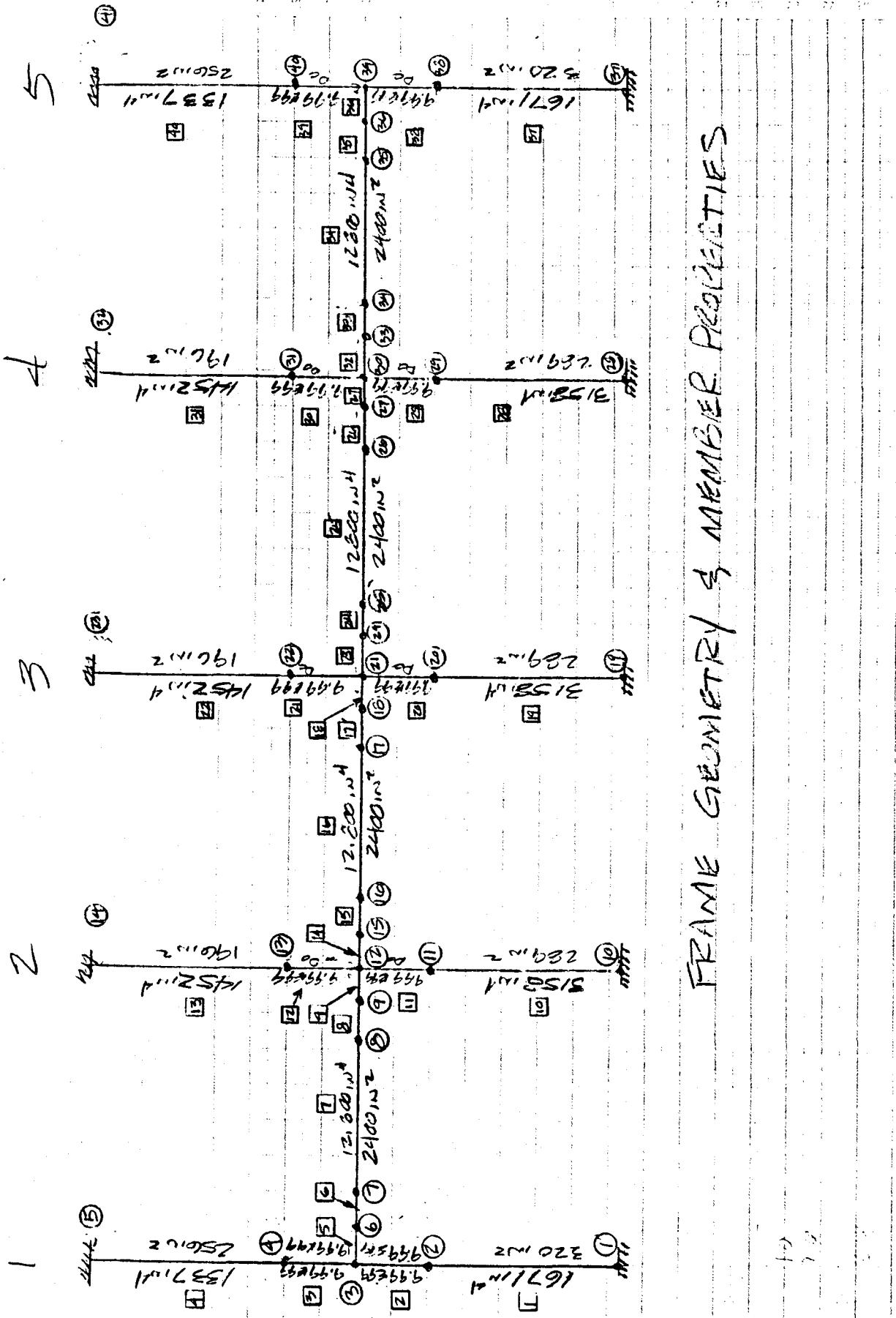
INTERIOR COLUMN STIFFNESSES CORRECTED FOR TORSION:

$$K_{ec} = \frac{(442,800 + 962,700)(455,440)}{442,800 + 962,700 + 455,440} = 344,000 \text{ kN/rad}$$

CORRECTION FACTOR FOR INTERIOR COLUMNS:

$$KF_i = \frac{344,000}{442,800 + 962,700} = 0.2448$$

Job Title FLOOR ANAL E517610D By PC Date 5-25-70 Job no. 7043  
 Subject EQUIVALENT FRAME Checked Sheet 7 of 32



### FRAME GEOMETRY & MEMBER PROPERTIES

JOINT NODE GEOMETRY			
NODE	X-CORD	Y-CORD	Z-CORD
1	F	0	0
2		120	-
3		128	-
4		132	-
5	R	0	252
6		128	-
7		128	-
8		128	245.75
9		128	237.25
10	F	295.75	0
11		120	295.75
12		128	295.75
13		132	295.75
14	R	295.75	252
15		128	304.25
16		128	345.75
17		128	545.75
18		128	575.25
19	F	545.75	0
20		120	545.75
21		128	545.75
22		132	545.75
23	R	545.75	252
24		128	604.25
25		128	645.75
26		128	245.75
27		128	237.25
28	F	295.75	0
29		120	295.75
30		128	295.75
31		132	295.75
32	R	295.75	252
33		128	904.25
34		128	745.75

Subject EQUIVALENT FRAME Checked Sheet 9 of 32

## MEMBER PROPERTIES

MEMBER	J-NOVE	K-NOVE	A	I	E
1	1	2	320	1671	3491
2	2	3	1E32	1E32	3491
3	3	4	1E32	1E32	3491
4	4	5	256	1337	3491
5	3	6	2800	27,510	3122
6	6	7	2300	25,676	3122
7	7	8	2400	12,800	3122
8	8	9	2300	25,676	3122
9	9	12	2800	21,510	3122
10	10	11	239	3158	3491
11	11	12	1E32	1E32	3491
12	12	13	1E32	1E32	3491
13	13	14	196	1452	3491
14	12	15	2300	21,510	3122
15	15	16	2800	25,676	3122
16	16	17	2400	12,800	3122
17	17	18	2300	25,676	3122
18	18	21	2300	27,510	3122
19	19	20	239	3158	3491
20	20	21	1E32	1E32	3491
21	21	22	1E32	1E32	3491
22	22	23	196	1452	3491
23	21	24	2300	21,510	3122
24	24	25	2300	25,676	3122
25	25	26	2400	12,800	3122
26	26	27	2300	25,676	3122
27	27	30	2300	21,510	3122
28	28	29	239	3158	3491
29	29	30	1E32	1E32	3491
30	30	31	1E32	1E32	3491
31	31	32	196	1452	3491
32	30	33	2300	27,510	3122
33	33	34	2300	25,676	3122
34	34	35	2400	12,800	3122
35	35	36	2300	25,676	3122
36	36	39	2300	21,510	3122

Job Title FLLOOR ANA/AC@51762D By PC Date 5-31-80 Job no. 9043  
Subject EQUIVALENT FRAME Checked \_\_\_\_\_ Sheet 10 of 32

MEMBER/J-NODE

MEMBER PROPERTIES

<u>K-NODE</u>	<u>A</u>	<u>I</u>	<u>E</u>
37	37	38	320
38	38	39	1 E 32
37	39	40	1 E 32
40	40	41	256
			1331

JOINT RESTRAINTS

JOINT ①  
RESTRAINT X-TRANS.      Y-TRANS.      Z-ROTAT.

1	1	1	1
5	1	0	1
10	1	1	1
14	1	0	1
19	1	1	1
23	1	0	1
23	1	1	1
32	1	0	1
37	1	1	1
41	1	0	1

LOADS:

THE AREAS NORTH OF GRID 2 AND SOUTH OF GRID 4 HAVE 5'WIDE CORRIDORS WITH PLASTER WALLS AND OFFICES WITH PARTITIONS @ 12' O.C.

PLASTER PARTITIONS:

STUDS @ 16" O.C. - 0.8 PSF  
PLASTER @ 2 SIDES - 16.0 PSF

$$16.8 \text{ PSF} \times 9' = 151 \text{ PLF}$$

$$50 \text{ PLF} \div 12' + 151 \text{ PLF} \div 25' = 10.3 \text{ PSF USE } 15 \text{ PSF}$$

$$15 \text{ PSF} \times 25' = 375 \text{ PLF} \times 1.4 = 525 \text{ PLF}$$

$$\text{OFFICE LIVE LOAD: } 50 \text{ PSF} \times 25' = 1250 \text{ PLF}$$

$$\times 1.7 = 2125 \text{ PLF}$$

$$\text{CORRIDOR LIVE LOAD INCREASE: } (100 \text{ PSF} - 50 \text{ PSF})(5') \times (25') = 6250 \text{ LB}$$

$$\times 1.7 = 10625 \text{ LB}$$

FILE ROOM:

UBC DOES NOT ADDRESS FILE ROOM LIVE LOADS.

→ TYPICAL LETTER FILES ARE OF 20GA. STEEL, 5 DRAWERS HIGH

EACH DRAWER IS 24" X 18" X 14" HIGH

$$[2(20' \times 1.17') + 2(1.5' \times 1.17') + 2(2.02' \times 1.5')] \left( \frac{0.0359}{12''} \right) (490 \text{ psf}) \\ = 21^{\text{cu ft}} \text{ SAY } 25^{\text{cu ft}}$$

PAPER HAS A UNIT WEIGHT OF 45 PSF TO 70 PSF USE 58 PSF

$$20' \times 1.5' \times 1.17' \times 58 \text{ psf} = 203 \text{ cu ft}$$

5 FILES HIGH:

$$5(25^{\text{cu ft}} + 203^{\text{cu ft}}) = 1140^{\text{cu ft}}$$

→ TYPICAL FLAT FILES ARE OF 20GA. STEEL,  
5 DRAWERS UNITS. EACH UNIT IS 3' X 4'-7" X 1'-5" HIGH.  
4 UNITS ARE STACKED.

EACH UNIT:

$$[1(3' \times 4.58') + 2(3' \times 1.42') + 2(4.58' \times 1.42')] \left( \frac{0.0359}{12''} \right) (490 \text{ psf}) \\ = 173^{\text{cu ft}} \text{ SAY } 175^{\text{cu ft}}$$

LOOSE PAPER & MYLAR:

$$3' \times 4.58' \times 1.42' \times 45 \text{ psf} = 377 \text{ lb}$$

$$4(175^{\text{cu ft}} + 377 \text{ lb}) = 1208^{\text{cu ft}}$$

→ BOOK SHELVES ARE OF 16GA. STEEL, 6 SHELVES  
6'-6" HIGH, 12" DEEP, 3' WIDE.

$$[2(1' \times 3')] \left( \frac{0.066}{12''} \right) (490 \text{ psf}) = 52.8 \text{ lb SAY } 75 \text{ lb}$$

$$(0.5' \times 1' \times 3' \times 98 \text{ psf}) = 1131 \text{ lb}$$

$$75 \text{ lb} + 1131 \text{ lb} = 1206 \text{ lb}$$

ONE AREA IS 13' X 31', HAS 7 FLATFILE STACKS,  
15 FILE STACKS & 14 BOOK SHELVES

$$W_L = \frac{7 \times 4203^{\text{cu ft}} + 15 \times 1140^{\text{cu ft}} + 14 \times 1206^{\text{cu ft}}}{13' + 31'} = 1570 \text{ psf}$$

ONE AREA IS 25 1/2" X 15 1/3", HAS 18 FILE STACKS,  
8 FLATFILE STACKS, 1 POOL SHELF & REFRIGERATOR  
(SAY 3001B).

$$W_L = \frac{18 \times 1140^{\text{cu ft}} + 8 \times 4203^{\text{cu ft}} + 1206^{\text{cu ft}} + 3001^{\text{lb}}}{25.5' \times 15.33'} = 142 \text{ psf}$$

Job Title FLOOR ANAL. @ 5176000 By PC Date 5-31-90 Job no. 9043  
Subject EQUIVALENT FRAME Checked Sheet 12 of 32

THERE IS TYPICALLY A 2' WIDE & A 3' WIDE LANE  
PARKING FILED IN EACH AREA;  

$$\frac{(2' + 3')}{13' \times 31'} \times 20 \text{ PLF} = 7.7 \text{ PLF SAY 8 PLF}$$

FILE LIVE LOAD INCREASE:

$$(157 \text{ PLF} + 8 \text{ PLF}) - 50 \text{ PLF} = 115 \text{ PLF}$$

$$\text{P/L ENR'D, } 2\frac{1}{2}4 \text{ w} = (15 \text{ PLF})(13') = 195 \text{ PLF}$$

$$\text{P/L CIR'D 3\frac{1}{2}4, EXTRA P/L AT KIDS OUT} \\ P = (15 \text{ PLF})(5\frac{1}{3})(12\frac{1}{2}') = 2204213 \\ \times 1.7 = 37,471 \text{ LB}$$

"TYPICAL DEAD LOAD":

$$w_d = (15 \text{ PLF})(25')(1.4) + 525 \text{ PLF} = 4550 \text{ PLF}$$

FACTORED MEMBER DISTRIBUTED FULL LIVE & DEAD LOADS

MEMBER	WXS	WYE	WYS	WXE	LG#
5-9, 32-36	0	0	-0.55625 $\frac{k}{ft}$	-0.55625 $\frac{k}{ft}$	-1
14-18, 23-27	0	0	-0.768083 $\frac{k}{ft}$	-0.768083 $\frac{k}{ft}$	-1

$$4550 \text{ PLF} + 2125 \text{ PLF} = 6675 \text{ PLF} \div 12 = 556.25 \text{ kN}$$

$$6675 \text{ PLF} + 25412 \text{ PLF} = 9211 \text{ PLF} \div 12 = 768.083 \text{ kN}$$

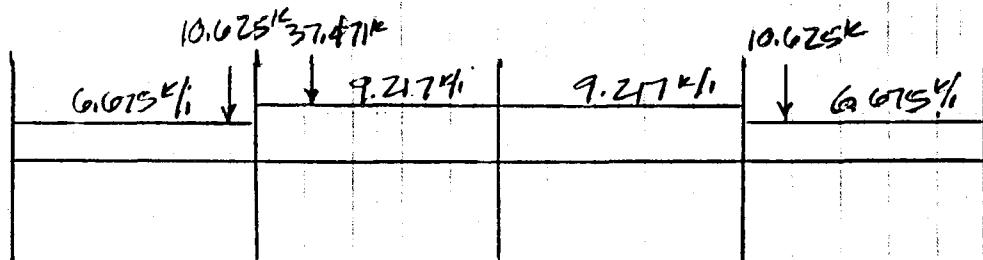
FACTORED MEMBER CONCENTRATED FULL LINE LOADS

MEMBER	X	WGX	WGY	LG#
8	24.25"	0	-13.625k	1
16	34"	0	-37.471k	1
33	21.50"	0	-10.1025k	1

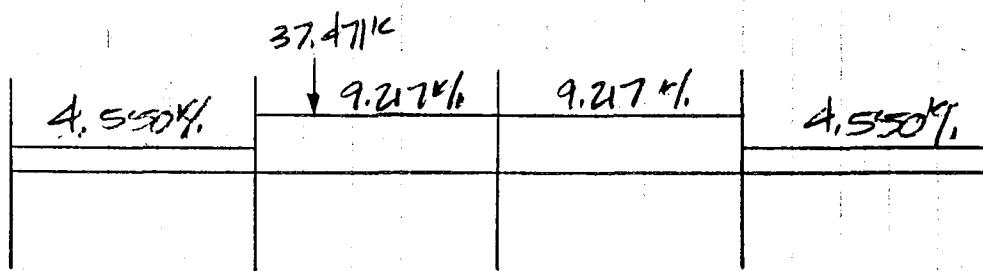
Job Title FLOOR ANALYSIS 517 GOLD By RC Date 5-31-70 Job no. 9043  
Subject EQUIVALENT Checked  Sheet B-32

<u>FACTORED MEMBER DISTRIBUTED SKIP LIVE &amp; DEAD LOADS</u>	<u>MEMBER #</u>	<u>WXS</u>	<u>WXE</u>	<u>WYS</u>	<u>WYE</u>	<u>LG#</u>
5-9, 32-36		0	0	-0.379 k	-0.379 k	1
14-18, 23-27		0	0	-0.768 k	-0.768 k	1

<u>FACTORED MEMBER CONCENTRATED SKIP LIVE &amp; DEAD LOADS</u>	<u>MEMBER #</u>	<u>X</u>	<u>WCX</u>	<u>WCY</u>	<u>LG#</u>
	16	34"	0	-374.71 k	1



FULL FACTORED LIVE LOAD



SKIP FACTORED LIVE LOAD

SEE SAPPHO COMPUTER RUNS AT END  
OF CALCULATIONS

$$\rho_T = \frac{E_{cb} C}{2 E_{cs} I_s}$$
$$E_{cb} = 3491 \text{ ksi}$$
$$C = 12,304 \text{ in}^4$$
$$E_{cs} = 31,221 \text{ ksi}$$
$$I_s = 25,676 \text{ in}^4$$

$$\beta_T = \frac{(3491 \text{ ksi})(12,304 \text{ in}^4)}{2(31,221 \text{ ksi})(25,676 \text{ in}^4)} = 0.2738 < 2.5$$

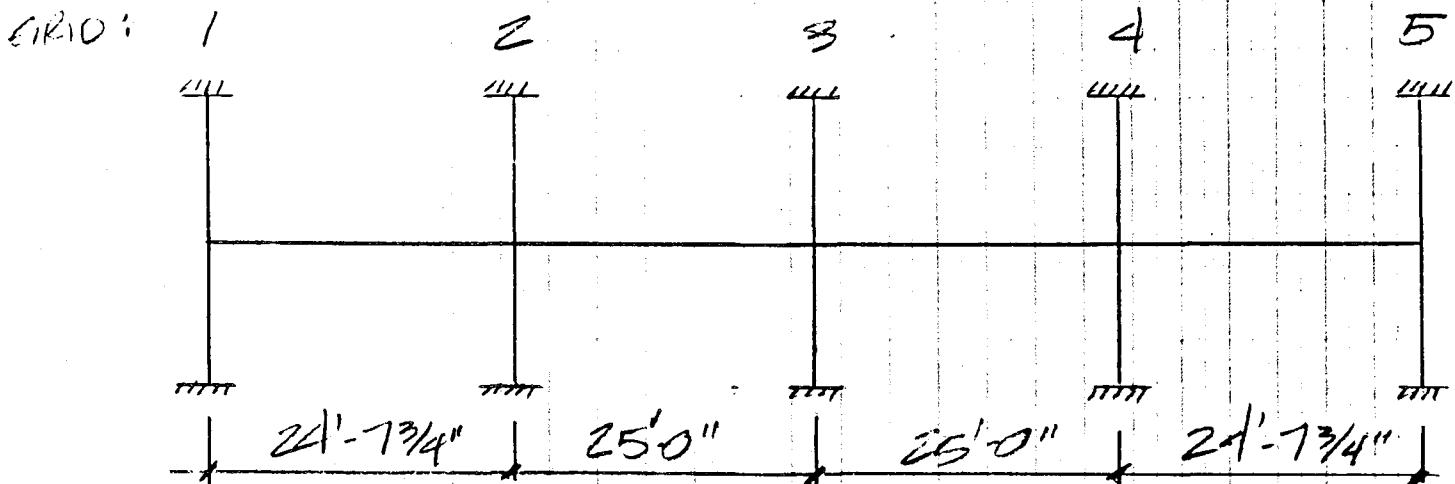
$$100\% - \frac{0.2738}{2.5}(25\%) = 97.2\%$$

97.2% NEG. EXT. TO COLUMN STORED

60% POS. EXT. TO COLUMN STORED

75% NEG. INT. TO COLUMN STORED

60% POS. INT. TO COLUMN STORED



### FULL LINE LOAD

TOTAL	-74.9 <sup>k</sup>	-516.8 <sup>k</sup>	-547.0 <sup>k</sup>	-375.6 <sup>k</sup>	-482.7 <sup>k</sup>	-448.0 <sup>k</sup>	460.4 <sup>k</sup>	-89.0 <sup>k</sup>
FACTORED	+188.8 <sup>k</sup>	+360.4 <sup>k</sup>	+75.6 <sup>k</sup>	+175.6 <sup>k</sup>	+203.8 <sup>k</sup>			
MOMENT	+91.9 <sup>k</sup>	-209.4 <sup>k</sup>	-125.5 <sup>k</sup>	-150.9 <sup>k</sup>	-156.9 <sup>k</sup>	-132.3 <sup>k</sup>	-160.3 <sup>k</sup>	+88.9 <sup>k</sup>
COLUMN	-72.8 <sup>k</sup>	-387.6 <sup>k</sup>	-410.2 <sup>k</sup>	-296.7 <sup>k</sup>	-362.0 <sup>k</sup>	-336.0 <sup>k</sup>	-345.3 <sup>k</sup>	-26.5 <sup>k</sup>
STRIP	+113.3 <sup>k</sup>	+216.2 <sup>k</sup>	+105.4 <sup>k</sup>	+122.3 <sup>k</sup>				
MOMENT	+55.1 <sup>k</sup>	-157.0 <sup>k</sup>	-94.1 <sup>k</sup>	-118.9 <sup>k</sup>	-117.7 <sup>k</sup>	-99.2 <sup>k</sup>	-120.2	+53.3 <sup>k</sup>
MIDDLE	-2.10 <sup>k</sup>	-129.2 <sup>k</sup>	-136.8 <sup>k</sup>	-98.9 <sup>k</sup>	-120.7 <sup>k</sup>	-112.0 <sup>k</sup>	-115.1 <sup>k</sup>	-2.50 <sup>k</sup>
STRIP	+75.3 <sup>k</sup>	+144.2 <sup>k</sup>	+70.2 <sup>k</sup>	+81.5 <sup>k</sup>				
MOMENT	+36.8 <sup>k</sup>	-52.4 <sup>k</sup>	-31.4 <sup>k</sup>	-39.6 <sup>k</sup>	-39.2 <sup>k</sup>	-33.1 <sup>k</sup>	-40.1 <sup>k</sup>	+35.6 <sup>k</sup>

### SKIP LINE LOAD

TOTAL	-31.4 <sup>k</sup>	-413.6 <sup>k</sup>	-473.6 <sup>k</sup>	-429.9 <sup>k</sup>	-521.6 <sup>k</sup>	-378.7 <sup>k</sup>	-355.0 <sup>k</sup>	-48.2 <sup>k</sup>
FACTORED	+113.2 <sup>k</sup>	+327.8 <sup>k</sup>	+192.6 <sup>k</sup>	+192.6 <sup>k</sup>	+125.5 <sup>k</sup>			
MOMENT	+60.0 <sup>k</sup>	-201.3 <sup>k</sup>	-72.9 <sup>k</sup>	-181.6 <sup>k</sup>	-179.9 <sup>k</sup>	-73.9 <sup>k</sup>	-153.5 <sup>k</sup>	+63.1 <sup>k</sup>
COLUMN	+33.4 <sup>k</sup>	-310.2 <sup>k</sup>	-359.0 <sup>k</sup>	-322.1 <sup>k</sup>	-311.2 <sup>k</sup>	-284.0 <sup>k</sup>	-266.2 <sup>k</sup>	-46.8 <sup>k</sup>
STRIP	+67.9 <sup>k</sup>	+19.6 <sup>k</sup>	+19.6 <sup>k</sup>	+15.6 <sup>k</sup>	+15.6 <sup>k</sup>	+15.6 <sup>k</sup>	+15.6 <sup>k</sup>	
MOMENT	+37.6 <sup>k</sup>	-151.0 <sup>k</sup>	-54.7 <sup>k</sup>	-136.2 <sup>k</sup>	-134.9 <sup>k</sup>	-59.2 <sup>k</sup>	-115.1 <sup>k</sup>	+37.9 <sup>k</sup>
MIDDLE	-1.0 <sup>k</sup>	-103.4 <sup>k</sup>	-719.6 <sup>k</sup>	-107.5 <sup>k</sup>	-130.4 <sup>k</sup>	-94.7 <sup>k</sup>	-88.8 <sup>k</sup>	-1.10 <sup>k</sup>
STRIP	+45.3 <sup>k</sup>	+131.1 <sup>k</sup>	+131.1 <sup>k</sup>	+77.0 <sup>k</sup>	+77.0 <sup>k</sup>	+77.0 <sup>k</sup>	+50.2 <sup>k</sup>	
MOMENT	+26.4 <sup>k</sup>	-50.3 <sup>k</sup>	-18.7 <sup>k</sup>	-45.4 <sup>k</sup>	-45.4 <sup>k</sup>	-19.7 <sup>k</sup>	-38.4 <sup>k</sup>	+25.2 <sup>k</sup>

### EXTERIOR NEGATIVE MOMENT CAPACITIES:

AT COLUMN STRIPS  $\rightarrow$  18#5 -  $A_s = 5.58 \text{ in}^2$ , #5 BAR + 3/4" CLEAR

$$d = 8" + 4" - \frac{3}{4}" - \frac{5}{8"} - \frac{5}{16"} = 10.3125"$$

$$\alpha = \frac{(5.58 \text{ in}^2)(50^{\text{ksi}})}{0.85(3^{\text{ksi}})(12.5' \times 12\frac{1}{4}')} = 0.729"$$

$$\phi M_n = 0.9 \left[ (1.86 \text{ in}^2)(10.31" - \frac{0.729"}{2}) + (3.72 \text{ in}^2)(10.31" - \frac{0.729"}{2}) \right] \frac{50^{\text{ksi}}}{12\%} =$$

$$180.7^{\text{k}} > 86.5 \text{ OK}$$

AT MIDDLE STRIPS  $\rightarrow$  20#5 -  $A_s = 6.20 \text{ in}^2$ ,  $d = 6.31$

$$\alpha = \frac{(6.20 \text{ in}^2)(50^{\text{ksi}})}{0.85(3^{\text{ksi}})(12.5' \times 12\frac{1}{4}')} = 0.810 \text{ in}^2 < 2\frac{1}{2}'' \text{ OK}$$

$$\phi M_n = 0.9 \left[ (6.20 \text{ in}^2)(50^{\text{ksi}})(6.31" - \frac{0.810"}{2}) \right] \frac{1}{12\%} = 137.3^{\text{k}}$$

$$137.3^{\text{k}} > 21.5^{\text{k}} \text{ OK}$$

### EXTERIOR POSITIVE MOMENT CAPACITIES:

AT COLUMN STRIPS  $\rightarrow$  28#5 -  $A_s = 8.68 \text{ in}^2$  #5 BAR + 1" CLEAR

$$d = 8" - 1" - \frac{5}{8"} - \frac{5}{16"} = 6.0625"$$

$$\alpha = \frac{(8.68 \text{ in}^2)(50^{\text{ksi}})}{0.85(3^{\text{ksi}})(12.5' \times 12\frac{1}{4}')} = 1.135"$$

$$\phi M_n = 0.9 \left[ (8.68 \text{ in}^2)(50^{\text{ksi}})(6.06" - \frac{1.135"}{2}) \right] \frac{1}{12\%} = 178.9^{\text{k}}$$

$$178.9^{\text{k}} > 122.3^{\text{k}} \text{ OK}$$

AT MIDDLE STRIPS  $\rightarrow$  22#5 -  $A_s = 6.82 \text{ in}^2$

$$\alpha = \frac{(6.82 \text{ in}^2)(50^{\text{ksi}})}{0.85(3^{\text{ksi}})(12.5' \times 12\frac{1}{4}')} = 0.872" < 2\frac{1}{2}'' \text{ OK}$$

$$\phi M_n = 0.9 \left[ (6.82 \text{ in}^2)(50^{\text{ksi}})(6.06" - \frac{0.872"}{2}) \right] \frac{1}{12\%} = 143.6^{\text{k}}$$

$$143.6^{\text{k}} > 80.5^{\text{k}} \text{ OK}$$

### 1ST INTERIOR NEGATIVE MOMENT CAPACITIES:

AT COLUMN STRIPS  $\rightarrow 32 \#5 - A_s = 9.92 \text{ in}^2 d = 10.3125''$

$$C = \frac{(9.92 \text{ in}^2)(50 \text{ ksi})}{0.85(3 \text{ in})(12.5' \times 12\%)} = 1.297 \text{ in}$$

$$\phi M_n = 0.9 \left[ (461 \text{ in}^2)(10.31) - \frac{1.297}{2} + (3.31 \text{ in}^2)(6.31) - \frac{1.297}{2} \right] \frac{50 \text{ ksi}}{12\%} = 309.9 \text{ kft}$$

$$309.9 < 410.2 \text{ NEG (132.4\%) } \leftarrow$$

$$309.9 < 387.6 \text{ NEG (125.1\%) } \leftarrow$$

$$309.9 < 315.3 \text{ NEG (111.4\%) } \leftarrow$$

AT MIDDLE STRIPS  $\rightarrow 18 \#5 - A_s = 5.58 \text{ in}^2 d = 6.31''$

$$C = 0.729''$$

$$\phi M_n = 0.9 \left[ (5.58 \text{ in}^2)(50 \text{ ksi}) \left( 6.31 - \frac{0.729}{2} \right) \right] \frac{1}{12\%} = 124.5 \text{ kft}$$

$$124.5 < 136.8 \text{ kft NEG (109.9\%) } \leftarrow$$

$$124.5 < 129.2 \text{ kft NEG (103.2\%) } \leftarrow$$

$$124.5 > 115.1 \text{ kft OIC}$$

### INTERIOR POSITIVE MOMENT CAPACITIES:

AT COLUMN STRIPS  $\rightarrow 26 \#5 - A_s = 8.06 \text{ in}^2$

$$C = \frac{(8.06 \text{ in}^2)(50 \text{ ksi})}{0.85(3 \text{ in})(12.5' \times 12\%)} = 1.054''$$

$$\phi M_n = 0.9 \left[ (8.06 \text{ in}^2)(50 \text{ ksi}) \left( 6.06 - \frac{1.054}{2} \right) \right] \frac{1}{12\%} = 167.3 \text{ kft}$$

$$167.3 < 212.2 \text{ kft NEG (122.8\%) } \leftarrow$$

$$167.3 > 115.6 \text{ OIC}$$

AT MIDDLE STRIPS  $\rightarrow 16 \#5 - A_s = 4.96 \text{ in}^2$

$$C = \frac{(4.96 \text{ in}^2)(50 \text{ ksi})}{0.85(3 \text{ in})(12.5' \times 12\%)} = 0.643'' (0.778'' \text{ PGR. 60})$$

$$\phi M_n = 0.9 \left[ (4.96 \text{ in}^2)(50 \text{ ksi}) \left( 6.06 - \frac{0.643}{2} \right) \right] \frac{1}{12\%} = 106.7 \text{ kft}$$

$$(\phi M_n = 126.6 \text{ kft IF GRADE 60.})$$

$$141.2 / 12(0.16) = 113.970$$

$$106.7 < 144.2 \text{ kft (125.1\%) } \leftarrow$$

$$106.7 > 77.0 \text{ OIC}$$

### INTERIOR NEGATIVE MOMENT CAPACITIES:

AT COLUMN STRIP  $\rightarrow 28 \# 5 - A_s = 2.68 \text{ in}^2$

$$d = \frac{(2.68 \text{ in}^2)(50 \text{ ksi})}{0.85(34 \text{ k}) (12 \text{ in} \times 12 \text{ in})} = 1.135" \quad (1.250" \text{ IF GRADE 60})$$

$$\phi M_n = 0.9 \left[ (50 \text{ ksi})(10.31" - \frac{1.135"}{2}) + (2189 \text{ in}^2)(6.31" - \frac{1.135"}{2}) \right] \frac{50 \text{ ksi}}{12 \text{ in}} = 273.8 \text{ k}$$

$(\phi M_n = 321.2 \text{ k}) \text{ PER RATE 60}$

$$\frac{321.2}{321.2} = 100.0\%$$

$$273.8 \text{ k} < 371.2 \text{ k} \text{ (142.9\%)} \\ 273.8 \text{ k} < 372.4 \text{ k} \text{ (117.8\%)} \leftarrow$$

AT MIDDLE STRIP  $\rightarrow 14 \# 5 - A_s = 4.34 \text{ in}^2$

$$d = \frac{(-1.34 \text{ in}^2)(50 \text{ ksi})}{0.85(34 \text{ k}) (12 \text{ in} \times 12 \text{ in})} = 0.567"$$

$$\phi M_n = 0.9 \left[ (4.34 \text{ in}^2)(50 \text{ ksi})(6.31" - \frac{0.567"}{2}) \right] \frac{1}{12 \text{ in}} = 73.1 \text{ k}$$

$$73.1 \text{ k} < 130.4 \text{ k} \text{ (132.9\%)} \leftarrow$$

$$73.1 \text{ k} < 120.7 \text{ k} \text{ (123.0\%)} \leftarrow$$

$$73.1 \text{ k} < 107.5 \text{ k} \text{ (109.6\%)} \leftarrow$$

### 1ST INTERIOR NEGATIVE MOMENT CAPACITIES (FACE / DROP):

AT COLUMN STRIP  $\rightarrow 32 \# 5, A_s = 9.92 \text{ in}^2, d = 1.297"$

$$\phi M_n = 0.9 \left[ (9.92 \text{ in}^2)(50 \text{ ksi})(6.31" - \frac{1.297"}{2}) \right] \frac{1}{12 \text{ in}} = 210.7 \text{ k}$$

$$210.7 \text{ k} > 151.0 \text{ k} \text{ OK}$$

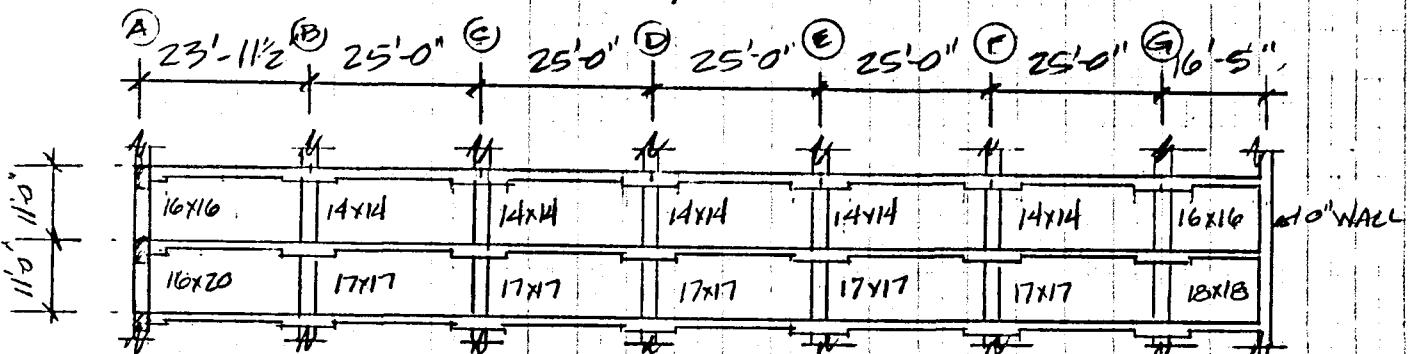
### INTERIOR NEGATIVE MOMENT CAPACITIES E/FACE / S/DROP:

AT COLUMN STRIP  $\rightarrow 28 \# 5 - A_s = 2.68 \text{ in}^2, d = 1.135"$

$$\phi M_n = 0.9 \left[ (2.68 \text{ in}^2)(50 \text{ ksi})(6.31" - \frac{1.135"}{2}) \right] \frac{1}{12 \text{ in}} = 187.0 \text{ k}$$

$$187.0 \text{ k} > 136.2 \text{ k} \text{ OK}$$

CONSIDER THE SEVEN-BAY FRAME ALONG GRID Z:



MOMENTS OF INERTIA -

SLAB-BEAM P/W DROPS -  $I_1 = 12,800 \text{ in}^4$

SLAB-PICAM C DROP -  $I_2 = 25,676 \text{ in}^4$

SLAB-BEAM w/ COLUMN -

② 17" x 17" INTERIOR COLUMNS:  $I_3 = 28,853 \text{ in}^4$

② 18" x 18" INTERIOR COLUMNS:  $I_3 = 25,676 \text{ in}^4 / \left(1 - \frac{18''}{25'' \times 12''}\right) = 27,315 \text{ in}^4$

③ 16" x 20" EXTERIOR COLUMN:  $I_3 = 27,510 \text{ in}^4$

③ 10" THICK WALL:  $I_3 = \infty$

14" x 14" (COLUMN)S -  $I_C = 3201 \text{ in}^4$

16" x 16" (COLUMN)S -  $I_C = 5401 \text{ in}^4$

17" x 17" (COLUMN)S -  $I_C = 6960 \text{ in}^4$

18" x 18" (COLUMN) -  $I_C = \frac{1}{12} (18') (18'')^3 = 2648 \text{ in}^4$

16" x 20" COLUMN -  $I_C = 6827 \text{ in}^4$

10" X 25' x WALL -  $I_C = \frac{1}{2} (25' \times 12'') (10'')^3 = 25,000 \text{ in}^4$

SPANDEREL BEAM TORSIONAL STIFFNESS:  $K_T = 1,413,500 \text{ kips/in}$

INTERIOR SLAB BEAM TORSIONAL STIFFNESS:  $K_T = 455,440 \text{ kips/in}$

WALL TORSIONAL STIFFNESS CORRECTION: NO CORRECTION

### COLUMN STIFFNESSES:

$$14'' \times 14'' \text{ COLUMNS: } K_c = 442,800 \text{ kNm/Rad}$$

$$16'' \times 16'' \text{ COLUMNS: } K_c = 755,400 \text{ kNm/Rad}$$

$$17'' \times 17'' \text{ COLUMNS: } K_c = 5.23(6960,10^4)(3491,500)/(11' \times 12\%) = 982,670 \text{ kNm/Rad}$$

$$18'' \times 18'' \text{ COLUMNS: } K_c = 5.23(3491,500)(2643,10^4)/(11' \times 12\%) = 1,196,171 \text{ kNm/Rad}$$

$$16'' \times 20'' \text{ COLUMNS: } K_c = 944,300 \text{ kNm/Rad}$$

### COLUMN STIFFNESS CORRECTION AT GRID 10 (1):

$$K_{cL} = \frac{(755,400 + 944,300)(1,413,500)}{755,400 + 944,300 + 1,413,500} = 771,720 \text{ kNm/Rad}$$

$$KF = \frac{771,720}{755,400 + 944,300} = 0.4537 \quad 5461 \times 0.4537 = 2473 \text{ in}^{-1}$$

$$6827 \times 0.4537 = 3097 \text{ in}^{-1}$$

### COLUMN STIFFNESS CORRECTION AT GRID 10S (2) - (6):

$$K_{cL} = \frac{(442,800 + 982,670)(455,440)}{442,800 + 982,670 + 455,440} = 345,162 \text{ kNm/Rad}$$

$$KF = \frac{345,162}{442,800 + 982,670} = 0.2421 \quad 3201 \times 0.2421 = 775 \text{ in}^{-1}$$

$$6960 \times 0.2421 = 1685 \text{ in}^{-1}$$

### COLUMN STIFFNESS CORRECTION AT GRID 7:

$$K_{cL} = \frac{(755,400 + 1,196,171)(455,440)}{755,400 + 1,196,171 + 455,440} = 369,264 \text{ kNm/Rad}$$

$$KF = \frac{369,264}{755,400 + 1,196,171} = 0.1892 \quad 5461 \times 0.1892 = 1033 \text{ in}^{-1}$$

$$8048 \times 0.1892 = 1636 \text{ in}^{-1}$$



Job Title FLOOR ANAL @ 512 GOLD By BC Date 6/12-90 Job no. 9043  
Subject EQUIVALENT FRAME Checked  Sheet 21 of 32

JOINT NODE GEOMETRY

NODE	X-COORD	Y-COORD	NODE	X-COORD	Y-COORD
1 F	0	252	35	1137.5	128
2 F	287.5	252	36	1179.0	128
3 F	587.5	252	37	1187.5	128
4 F	887.5	252	38	1196.0	128
5 F	1187.5	252	39	1237.5	128
6 F	1487.5	252	40	1437.5	128
7 F	1787.5	252	41	1473.0	128
8 F	1924.5	252	42	1487.5	128
-9	0	132	43	1496.0	128
-10	287.5	132	44	1537.5	128
-11	587.5	132	45	1737.5	128
-12	887.5	132	46	1779.0	128
13	1187.5	132	47	1787.5	128
14	1487.5	132	48	1796.0	128
15	1787.5	132	49	1837.5	128
16	1924.5	132	-50	1979.5	128
17	0	128	51	1984.5	128
18	8	128	52	0	120
19	50	128	53	287.5	120
20	287.5	128	54	587.5	120
21	219.0	128	55	887.5	120
22	287.5	128	56	1187.5	120
23	296.0	128	57	1487.5	120
24	337.5	128	58	1787.5	120
25	537.5	128	59	1984.5	120
26	579.0	128	60 F	0	0
27	587.5	128	61 F	287.5	0
28	596.0	128	62 F	587.5	0
29	637.5	128	63 F	887.5	0
30	837.5	128	64 F	1187.5	0
31	879.0	128	65 F	1487.5	0
32	887.5	128	66 F	1787.5	0
33	896.0	128	67 F	1984.5	0
34	937.5	128			

Job Title Floor/ML (25/17 Grid) By BC Date 6-12-90 Job no. 7043

Subject EQUIVALENT FRAMING Checked Sheet 22 of 32

MEMBER PROPERTIES						
MEMBER	J-NODE	K-NODE	A	I	E	DESCRIPTION
1	1	9	256	2478	3491	10x10 COLUMN
2	2	10	196	775	1	14x14 COLUMN
3	3	11	1	1	1	
4	4	12	1	1	1	
5	5	13	1	1	1	
6	6	14	196	775	1	14x14 COLUMN
7	7	15	256	1033	3491	10x10 COLUMN
8	8	16	3000	25003	3122	WALL
9	9	17	1000,000	1,000,000	3491	COLUMN POINT
10	10	22	1	1	1	
11	11	27	1	1	1	
12	12	32	1	1	1	
13	13	37	1	1	1	
14	14	42	1	1	1	
15	15	47	1,000,000	1,000,000	3491	COLUMN POINT
16	16	51	1,000,000	1,000,000	3122	WALL POINT
17	17	18	2800	27,510	3122	SLAB@COLUMN
18	21	22	1	28,853	1	
19	22	23	1	1	1	
20	26	27	1	1	1	
21	27	28	1	1	1	
22	31	32	1	1	1	
23	32	33	1	1	1	
24	36	37	1	1	1	
25	37	38	1	1	1	
26	41	42	1	1	1	
27	42	43	1	28,853	1	
28	46	47	1	21,315	1	
29	47	48	2800	27,315	3122	SLAB@COLUMN
30	18	19	2800	25,616	3122	SLAB@DROP
31	20	21	1	1	1	
32	23	24	1	1	1	
33	25	26	1	1	1	
34	28	29	1	1	1	
35	30	31	2300	25,616	3122	SLAB@DROP

6-12-90

By  Date

Date

**Job no.**

7x13

Subject EQUIVALENT FRAME Checked Sheet 23 of 36

MEMBER	S-NODE	K-NODE	MEMBER PROPERTIES			DESCRIPTION
			A	I	E	
36	33	34	2800	25,676	3122	SLAB@DROP
37	35	36	1	1	1	1
38	38	39	1	1	1	1
39	40	41	1	1	1	1
40	43	44	1	1	1	1
41	45	46	1	1	1	1
42	48	49	2800	25,676	3122	SLAB@DROP
43	19	20	2400	12,800	3122	SLAB
44	241	25	1	1	1	1
45	27	30	1	1	1	1
46	341	35	1	1	1	1
47	37	40	1	1	1	1
48	44	45	1	1	1	1
49	49	50	2400	12,800	3122	SLAB
50	50	51	2400	1,000,000	3122	SLAB@WALL
51	17	52	1,000,000	1,000,000	3491	COLUMN JOINT
52	22	53	1	1	1	1
53	27	54	1	1	1	1
54	32	55	1	1	1	1
55	37	56	1	1	1	1
56	42	57	1	1	1	1
57	47	58	1,000,000	1,000,000	3491	COLUMN JOINT
58	50	59	1,000,000	1,000,000	3122	WALL@JOINT
59	52	60	320	3097	3491	16x10 COLUMN
60	53	61	289	1685	1	17x17 COLUMN
61	54	62	1	1	1	1
62	55	63	1	1	1	1
63	56	64	1	1	1	1
64	57	65	289	1685	1	17x17 COLUMN
65	58	66	324	1636	3491	18x18 COLUMN
66	59	67	3000	25,000	3122	WALL

LOADS:

FILE LINE LOAD INCREASE

$$(157 \text{ PSF} + 3 \text{ PSF} - 50 \text{ PSF}) = 115 \text{ PSF}$$

FROM 11.5' FROM GRID E TO 12.5' PAST GRID F,  
12.5' OF FILE ROOM TRIBUTARY TO FRAME

$$1.7(12.5') (0.115 \text{ ksf}) / 12'' = 3,203.64583 \text{ k/in}$$

THIS LIVE LOAD IN ADDITION TO 50 PSF (0.17283 k/in)  
FROM 1325.5 TO 1637.5

112' 100'

FACTORED MEMBER DISTRIBUTED FULL LIVE & DEAD LOADS

<u>MEMBER</u>	<u>WXS</u>	<u>WXE</u>	<u>WYS</u>	<u>WYE</u>	<u>LG#</u>
30-38, 17, 25, 28, 29	0	0	-0.55625	-0.55625 k/in	-1
39-40, 26, 27	0	0	-0.75989	-0.75989 k/in	-1
41-49	0	0	-0.55625	-0.55625 k/in	-1

FACTORED MEMBER CONCENTRATED FULL LIVES & DEAD LOADS

<u>MEMBER</u>	<u>X</u>	<u>WCX</u>	<u>WCY</u>	<u>LG#</u>
47	144	0	-22.203 k	1
48	50	0	-20.364583	1

FACTORED MEMBER DISTRIBUTED SKIP LIVE & DEAD LOADS

<u>MEMBER</u>	<u>WXS</u>	<u>WXE</u>	<u>WYS</u>	<u>WYE</u>	<u>LG#</u>
30-31			-0.556	-0.556	-1
32-33			-0.37916	-0.37916	-1
34-35			-0.556	-0.556	-1
36-37			-0.379	-0.379	-1
38			-0.556	-0.556	-1
39-40			-0.759	-0.759	-1
41			-0.556	-0.556	-1
42			-0.379	-0.379	-1
43, 45, 47, 48			-0.556	-0.556	-1
49, 46, 49			-0.379	-0.379	-1

SOME CONCENTRATED LOADS AS FULL LINE

GRIDS

D

4444

E

4444

F

4444

G

4444

WALL

4444

Z

25'-0"

25'-0"

25'-0"

16'-5"

2222 2222 2222 2222

### FULL LINE LOAD

TOTAL	-326.4 <sup>k</sup>	-345.6 <sup>k</sup>	-351.6 <sup>k</sup>	-449.7 <sup>k</sup>	-453.1 <sup>k</sup>	-295.7 <sup>k</sup>	-267.3 <sup>k</sup>
FACTORED	+123.1 <sup>k</sup>	+269.1 <sup>k</sup>	+312.2 <sup>k</sup>	+46.2 <sup>k</sup>	+53.2 <sup>k</sup>		
MOMENT	-96.7 <sup>k</sup>	-10.5 <sup>k</sup>	-104.4 <sup>k</sup>	-138.8 <sup>k</sup>	-137.6 <sup>k</sup>	-61.6 <sup>k</sup>	-33.8 <sup>k</sup>
COLUMN	-244.8 <sup>k</sup>	-259.2 <sup>k</sup>	-263.7 <sup>k</sup>	-337.2 <sup>k</sup>	-339.8 <sup>k</sup>	-221.8 <sup>k</sup>	-200.8 <sup>k</sup>
STRIP	+76.9 <sup>k</sup>	+161.5 <sup>k</sup>	+187.2 <sup>k</sup>	+27.7 <sup>k</sup>	+43.6 <sup>k</sup>		
MOMENT	-72.7 <sup>k</sup>	-32.9 <sup>k</sup>	-78.3 <sup>k</sup>	-104.1 <sup>k</sup>	-103.2 <sup>k</sup>	-46.2 <sup>k</sup>	-62.3 <sup>k</sup>
MIDDLE	-81.6 <sup>k</sup>	-86.4 <sup>k</sup>	-87.9 <sup>k</sup>	-112.4 <sup>k</sup>	-113.3 <sup>k</sup>	-73.9 <sup>k</sup>	-67.0 <sup>k</sup>
STRIP	+51.2 <sup>k</sup>	+107.6 <sup>k</sup>	+124.9 <sup>k</sup>	+18.5 <sup>k</sup>	+146.6 <sup>k</sup>		
MOMENT	-24.2 <sup>k</sup>	-27.1 <sup>k</sup>	-26.1 <sup>k</sup>	-34.7 <sup>k</sup>	-34.0 <sup>k</sup>	-15.4 <sup>k</sup>	-21.0 <sup>k</sup>

### SKIP LINE LOAD

TOTAL	-267.0 <sup>k</sup>	-203.8 <sup>k</sup>	-226.7 <sup>k</sup>	-477.3 <sup>k</sup>	-475.9 <sup>k</sup>	-271.5 <sup>k</sup>	-245.4 <sup>k</sup>
FACTORED	+50.9 <sup>k</sup>	+235.1 <sup>k</sup>	+329.0 <sup>k</sup>	+329.0 <sup>k</sup>	+44.3 <sup>k</sup>	+37.6 <sup>k</sup>	+12.1 <sup>k</sup>
MOMENT	-108.2 <sup>k</sup>	-105.9 <sup>k</sup>	-53.0	-152.9 <sup>k</sup>	-153.5 <sup>k</sup>	-44.3 <sup>k</sup>	-99.6 <sup>k</sup>
COLUMN	-202.2 <sup>k</sup>	-197.2 <sup>k</sup>	-215.0 <sup>k</sup>	-358.0 <sup>k</sup>	-356.9 <sup>k</sup>	-203.6 <sup>k</sup>	-184.0 <sup>k</sup>
STRIP	+30.5 <sup>k</sup>	+141.1 <sup>k</sup>	+197.4 <sup>k</sup>	+197.4 <sup>k</sup>	+15.1 <sup>k</sup>	-33.2 <sup>k</sup>	+22.0 <sup>k</sup>
MOMENT	-81.1	-79.4 <sup>k</sup>	-39.8 <sup>k</sup>	-114.7 <sup>k</sup>	-115.1 <sup>k</sup>	-33.2 <sup>k</sup>	-74.7 <sup>k</sup>
MIDDLE	-66.3 <sup>k</sup>	-66.0 <sup>k</sup>	-71.7 <sup>k</sup>	-119.3 <sup>k</sup>	-119.0 <sup>k</sup>	-67.9 <sup>k</sup>	-60.4 <sup>k</sup>
STRIP	+20.4 <sup>k</sup>	+94.0 <sup>k</sup>	+131.6 <sup>k</sup>	+131.6 <sup>k</sup>	-39.4 <sup>k</sup>	-16.1 <sup>k</sup>	+15.0 <sup>k</sup>
MOMENT	-27.1 <sup>k</sup>	-26.5 <sup>k</sup>	-13.2 <sup>k</sup>	-38.2 <sup>k</sup>	-39.4 <sup>k</sup>	-16.1 <sup>k</sup>	-24.9 <sup>k</sup>

## INTERIOR NEGATIVE MOMENT CAPACITIES!

AT COLUMN STRIPS  $\rightarrow 30\#5 - A_s = 9,30 \text{ in}^2 \quad 3\frac{1}{4}\text{" CLEAR}$

$$d = 8" + 4" - 3\frac{1}{4}" - 9\frac{1}{4}" = 10,9375"$$

$$z = \frac{(9,30 \text{ in}^2)(50 \text{ kip})}{0.85(3\frac{1}{4}\text") (12.5 \times 12\frac{1}{4}\text")} = 1,210"$$

$$\phi M_n = 0.9 \left[ (6,70 \text{ in}^2) \left( 10.94" - \frac{1.210"}{2} \right) + (3,10 \text{ in}^2) \left( 6.94" - \frac{1.210"}{2} \right) \right] \frac{5000}{12\frac{1}{4}} = 3137\frac{1}{2} \text{ kip} \cdot \text{in} \quad (\text{OK})$$

AT MIDDLE STRIPS  $\rightarrow 14,45 - A_s = 4,34 \text{ in}^2 \quad 3\frac{1}{4}\text" CLEAR$

$$d = 8" - 4" - 3\frac{1}{4}" - 9\frac{1}{4}" = 6,9375"$$

$$z = \frac{(4,34 \text{ in}^2)(50 \text{ kip})}{0.85(3\frac{1}{4}\text") (12.5 \times 12\frac{1}{4}\text")} = 0,567"$$

$$\phi M_n = 0.9 \left[ (4,34 \text{ in}^2)(50 \text{ kip}) \left( 6.94" - \frac{0.567"}{2} \right) \right] \frac{1}{12\frac{1}{4}} = 1083\frac{1}{2}$$

$108.3\frac{1}{2} < 119.3\frac{1}{2} \text{ NG (110.2\frac{1}{2})}$

$108.3\frac{1}{2} < 151.0\frac{1}{2} \text{ NG (109.9\frac{1}{2})}$

$108.3\frac{1}{2} < 113.3\frac{1}{2} \text{ NG (104.6\frac{1}{2})}$

$108.3\frac{1}{2} < 112.4\frac{1}{2} \text{ NG (103.8\frac{1}{2})}$

$108.3\frac{1}{2} > 87.9\frac{1}{2} \text{ OK}$

## INTERIOR POSITIVE MOMENT CAPACITIES!

AT COLUMN STRIPS  $\rightarrow 22\#5 - A_s = 6,82 \text{ in}^2 \quad 1\text" COVR$

$$d = 8" - 1" - 5\frac{1}{4}" = 6,6275"$$

$$z = \frac{(6,82 \text{ in}^2)(50 \text{ kip})}{0.85(3\frac{1}{4}\text") (12.5 \times 12\frac{1}{4}\text")} = 0,892"$$

$$\phi M_n = 0.9 \left[ (6,82 \text{ in}^2)(50 \text{ kip}) \left( 6.69" - \frac{0.892"}{2} \right) \right] \frac{1}{12\frac{1}{4}} = 159.6\frac{1}{2}$$

$159.6\frac{1}{2} < 197.4\frac{1}{2} \text{ NG (123.7\frac{1}{2})}$

$159.6\frac{1}{2} < 187.3\frac{1}{2} \text{ NG (117.3\frac{1}{2})}$

$159.6\frac{1}{2} < 161.5\frac{1}{2} \text{ NG (101.2\frac{1}{2})}$

$159.6\frac{1}{2} > 141.1\frac{1}{2} \text{ OK}$

AT MIDDLE STRIPS  $\rightarrow 16 \# 5$  -  $A_s = 4.96 \text{ in}^2$  1" COVER  
 $d = 6.0875"$

$$c = \frac{(4.96 \text{ in}^2)(50 \text{ kip})}{0.85(30 \text{ ksi})(12.5" \times 12\frac{1}{8}')} = 0.643"$$

$$\phi M_n = 0.9 \left[ (4.96 \text{ in}^2)(50 \text{ kip}) \left( 6.0875" - \frac{0.643"}{2} \right) \right] \frac{1}{12\frac{1}{8}'} = 118.4 \text{ kip}$$

$$118.4 \text{ kip} < 131.6 \text{ kip NG (111.29)} - \\ 118.4 \text{ kip} < 124.9 \text{ kip NG (105.52)} - \\ 118.4 \text{ kip} > 107.6 \text{ kip OK}$$

### EXTERIOR NEGATIVE MOMENT CAPACITIES:

AT COLUMN STRIP  $\rightarrow 5 \# 9" \text{ C.I.}$  -  $A_s = 5.17 \text{ in}^2$  3/4" CLEAR  
 $d = 6.94"$

$$c = \frac{(5.17 \text{ in}^2)(50 \text{ kip})}{0.85(30 \text{ ksi})(12.5" \times 12\frac{1}{8}')} = 0.676"$$

$$\phi M_n = 0.9 \left[ (5.17 \text{ in}^2)(10.94" - \frac{0.676"}{2}) \right] \frac{50 \text{ kip}}{12\frac{1}{8}'} = 127.9 \text{ kip} > 43.6 \text{ kip OK}$$

SAME AT MIDDLE STRIP:  $127.9 \text{ kip} > 14.6 \text{ kip OK}$

### EXTERIOR POSITIVE MOMENT CAPACITIES:

AT COLUMN STRIP  $\rightarrow 22 \# 5$

AT MIDDLE STRIP  $\rightarrow 22 \# 5$  }  $A_s = 6.182 \text{ in}^2$   $d = 6.0875"$

$$\phi M_n = 159.6 \text{ kip} > 27.7 \text{ kip OK}$$

### INTERIOR NEGATIVE MOMENT CAPACITIES @ FACE/DROP:

AT COLUMN STRIP  $\rightarrow 30 \# 5$  -  $A_s = 9.30 \text{ in}^2$  3/4" CLEAR,  $c = 1.216"$

$$\phi M_n = 0.9 \left[ (9.30 \text{ in}^2)(50 \text{ kip}) \left( 6.94" - \frac{1.216"}{2} \right) \right] \frac{1}{12\frac{1}{8}'} = 220.7 \text{ kip} > 115.1 \text{ kip OK}$$

613-90

Job Title FLOOR ANALYSIS 1600 By BZ Date   Job no. 9243

Subject SHEAR Checked   Sheet 28 of 32

CONSIDER PIER SHEAR:

AT DROP PANELS:

$$\phi V_c = 0.85 \times 2 \frac{\sqrt{3000}}{1000} [(25" \times 12") (0.94") + (2.33" \times 2") (2")]$$

$$= 231 k$$

AT N-S STRIP,  $V_u = 137.81 k$  @ JOINT 15

$$137.81 k - \left( \frac{0.94"}{2"} \right) (10.655") = 131.01 k < 231 k \text{ O.K.}$$

AT E-W STRIP,  $V_u = 109.59 k$  @ JOINT 41 O.K.

AT REGULAR-LAPS:

$$\phi V_c = 0.85 \times 2 \frac{\sqrt{3000}}{1000} (25" \times 12") (0.94") = 193.8 k$$

AT N-S STRIP,  $V_u = 101.39 k$  @ JOINT 10 < 193.8 k O.K.

AT E-W STRIP,  $V_u = 105.65 k$  @ JOINT 41 O.K.

CONSIDER PUNCHING SHEAR:

MOST HEAVILY LOADED COLUMN AT GRID F-2, 17" x 17"

$$b_o = 4 (17" + 10.69") = 110.75"$$

$$\phi V_c = 0.85 \times 4 \frac{\sqrt{3000}}{1000} (110.75") (10.69") = 220.5 k$$

DEAD LOAD:  $V_d = (25" \times 25") (0.115 ksf) + (2.33" \times 2.33") (0.33") (G, 150 ksf) = 75.3 k$

$$V_{du} = 1.4 \times 75.3 = 105.5 k$$

LIVE LOAD:  $V_L = (25" \times 25") (0.050 ksf) + (4) (25") (0.050 ksf) \left( \frac{23}{25} \right)$   
 $+ (13") (15.1") (0.115 ksf) \left( \frac{10.5}{25"} \right) \left( \frac{18.0}{25"} \right)$   
 $+ (12") (13.1") (0.115 ksf) \left( \frac{19}{25} \right)$   
 $= 31.25 k (\text{BASIC}) + 4.60 k (\text{EXIT ADD}) + 12.0 k (\text{STORAGE})$   
 $+ 13.72 k (\text{STORAGE}) = 61.57 k$

$$V_{Lu} = 104.67 k$$

$$V_u = 105.5 k + 104.67 k = 210.2 k < 220.5 k \text{ O.K.}$$

WORST OVERLOAD IS 142.9% AT NEGATIVE MOMENT  
AT COLUMN STRIP. AT STOREAGE AREA NEAR COLUMN F3

$$w_D = 115 \text{ psf} \quad w_{DU} = 1.4 \times 115 \text{ psf} = 161 \text{ psf}$$

$$w_L = 50 \text{ psf (BASIC)} + 123 \text{ psf (STORAGE)} = 173 \text{ psf}$$

$$w_{LU} = 1.7(50 \text{ psf}) + 1.7(123 \text{ psf}) = 85 \text{ psf} + 209 \text{ psf} = 294 \text{ psf}$$

$$w_{UA} = \frac{161 \text{ psf} + 294 \text{ psf}}{1.429} = 318 \text{ psf}$$

$$w_{LUA} = 318 \text{ psf} - 161 \text{ psf} - 2 \text{ psf} = 149 \text{ psf ALLOWABLE}$$

$$w_{LA} = 149 \text{ psf} \div 1.7 = 87.9 \text{ psf ALLOWABLE}$$

$$15 \text{ FLAT FILES @ } 420 \text{ lbs} = 63,120 \text{ lbs}$$

$$33 \text{ FILE STACKS @ } 1140 \text{ lbs} = 37,620 \text{ lbs}$$

$$15 \text{ BOOK SHELVES @ } 1200 \text{ lbs} = 18,000 \text{ lbs AND}$$

$$1 \text{ REFRIGERATOR @ } \frac{300 \text{ lbs}}{300 \text{ lbs}}$$

$$\text{TOTAL LOAD } 119,130 \text{ lbs}$$

$$15 \text{ FLAT FILES @ } 13.75 \text{ ft} = 206.25 \text{ ft}$$

$$33 \text{ FILE STACKS @ } 3.00 \text{ ft} = 99.0 \text{ ft}$$

$$15 \text{ BOOK SHELVES @ } 3.00 \text{ ft} = 45.0 \text{ ft}$$

$$1 \text{ REFRIGERATOR @ } \frac{6 \text{ ft}}{3.50.25 \text{ ft}}$$

IF 20% LIVELoad REDUCED TO 12% BETWEEN UNITS  
FOR AREA OVER 650 ft<sup>2</sup>

$$\frac{119,130 \text{ lbs} + (12 \text{ psf})(A - 356.25 \text{ ft})}{A} < 87.9 \text{ psf}$$

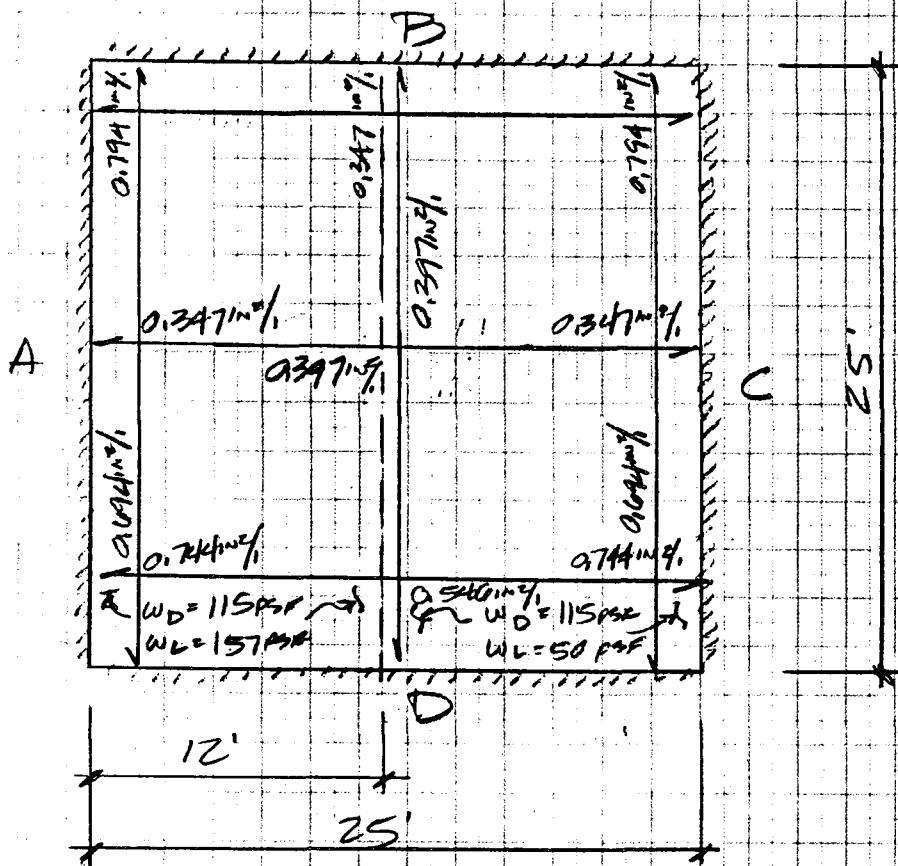
$$A \geq 1513 \text{ ft}^2$$

USE 30' x 51'-2" STORE ROOM

$$\text{ALTERNATELY: } \frac{123 \text{ psf} - 87.9 \text{ psf}}{123 \text{ psf}} = 0.28$$

REMOVE 28% OF EACH TYPE OF UNIT OR  
A COMBINATION THAT YIELDS SAME LOAD REDUCTION  
LEAVE 10 FLAT FILES, 23 FILE STACKS, 9 BOOK SHELVES, &

CONSIDER PANEL BETWEEN GRIDS F & G AND  
2 & 3:



MOMENTS DUE TO BASIC UNIFORM LOAD

$$M_A = M_B = M_C = M_D = -0.0513(0.165 \text{ ksf})(25)^2 = -5.29 \text{ kft}.$$

$$M_{GR} = 0.0231(0.165 \text{ ksf})(25)^2 = 2.33 \text{ kft}.$$

MOMENTS DUE TO ADDITIONAL LOAD ON A STRIP N-S:

$$M_B = M_D = -\frac{1}{12}(0.005 \text{ ksf})(25')^2 = -3.39 \text{ kft}$$

$$M_{GR} = \frac{1}{12}(0.005 \text{ ksf})(25')^2 = 3.39 \text{ kft}$$

MOMENTS DUE TO ADDITIONAL LOAD ON A STRIP E-W:

$$M_A = -\frac{12(0.005 \text{ ksf})(6')(19')^2}{25'} = -2.70 \text{ kft}$$

$$M_C = -\frac{12(0.005 \text{ ksf})(6')^2(19')}{25'} = -0.85 \text{ kft}$$

$$M_{GR} = \frac{12(0.005 \text{ ksf})(19')^2[3(6') + 17']}{25'} - \frac{1}{2}(0.005 \text{ ksf})(12)(20)^2 = 3.42 \text{ kft}$$

Job Title FLOOR ANALYSIS BY EC Date 6-15-90 Job no. 9043

Subject DEFLECTIONS

Checked

Sheet 31 of 32

AT DROP SLABS OVER COLUMN STRIP

$$y = \frac{(8.33')(4'')(2'') + (12.5')(8'')(8'')}{(8.33')(4'') + (12.5')(8'')} = 6.50''$$

$$J_g = \frac{1}{12}(8.33' \times 12\%) (4'')^3 + \frac{1}{12}(12.5' \times 12\%) (8'')^3 \\ + (8.33' \times 12\%) (4'') (6.50'' - 2'')^2 + (12.5' \times 12\%) (8'') (8'' - 6.50'')^2 \\ = 17,733 \text{ in}^4$$

CONSIDER  $M = 0.75[-5.29\text{k}/\text{l} - 2.70\text{k}/\text{l}](12.5) = -24.22\text{k}$   
w/ 9.30 in<sup>2</sup> @ 1" FROM TOP E-W

CONSIDER  $M = 0.75[-5.29\text{k}/\text{l} - 0.25\text{k}/\text{l}](12.5) = -57.56\text{k}$   
w/ 9.30 in<sup>2</sup> @ 1" FROM TOP E-W

AT SLABS, STRIPS  $J_g = \frac{1}{12}(12.5' \times 12\%) (8'')^3 = 20,000 \text{ in}^4$ 

AT COLUMN STRIP, CONSIDER  $M = 0.60[2.38\text{k}/\text{l} + 3.42\text{k}/\text{l}](12.5) = 43.50\text{k}$   
w/ 10.33 in<sup>2</sup> @ 1.31" FROM BOTTOM

AT MIDDLE STRIP

CONSIDER  $M = 0.25(-5.29\text{k}/\text{l} - 3.39\text{k}/\text{l})(12.5) = -27.12\text{k}$   
w/ 4.30 in<sup>2</sup> @ 1.68" FROM TOP

CONSIDER  $M = 0.40(-2.28\text{k}/\text{l} + 3.39\text{k}/\text{l})(12.5) = 28.85\text{k}$   
w/ 4.90 in<sup>2</sup> @ 1.94" FROM BOTTOM

Job Title FLOOR ANAL OF 17 GOLD By EZ Date 6/15/90 Job no. 7043Subject DEFLECTIONS

Checked

Sheet 32 of 32@ COLUMN STRIP:

$$I_e = 17733 \text{ in}^4 @ 26.28 \text{ in}$$

$$I_e = 17733 \text{ in}^4 @ 57.56 \text{ in}$$

$$I_c = 6400 \text{ in}^4 @ 43.50 \text{ in}$$

$$I_{ne} = 13955 \text{ in}^4$$

C MIDDLE STRIP:

$$I_e = 6400 \text{ in}^4 @ \text{ALL LOCATIONS}$$

FOR COLUMN STRIP:

$$\Delta_t = \left[ 0.00065 (0.165)^4 (12.5) (25)^4 + \frac{6.107 \times (12.5) (12)}{48 (25)} (708) \right] \frac{1728}{(3122 \times 13955)}$$

$$= 0.208'' = \frac{L}{1442}$$

FOR MIDDLE STRIP:

$$\Delta_t = \frac{5(6.212)^4 (12.5) (25)^4 (1728)}{708 (3122) (6400 \text{ in}^4)} = 0.748'' = \frac{L}{401}$$

$$2\Delta = 0.956'' = \frac{L}{313} \text{ Neg.}$$

THE "WITNESS" OF THE BIBLE

PUT DATA FROM FILE NAME 3999.PF

DATE 06-12-1990

Randy Holt & Associates  
 North-South Equivalent Frame Full Live Load  
 Seventh Floor at 517 Gold

## UNITS USED THROUGHOUT ANALYSIS

Moment : Kip-In  
 Coordinates : Inch  
 Member Weight : Lbs./ Ft.  
 Moment of Inertia : In ^ 4  
 Cross Sectional Area : Sq.In.  
 Modulus of Elasticity : Ksi

Applied Load or Force Transmitted : Kips  
 Displacement of Neutral Axis or Support : Inch  
 Rotation of Support Joint : Radian

## JOINT DATA

JOINT #	+,-X COORD Inch	+,-Y COORD Inch
*****1	*****+0.0000	*****+0.0000
*****2	*****+0.0000	*****+120.0000
*****3	*****+0.0000	*****+128.0000
*****4	*****+0.0000	*****+132.0000
*****5	*****+0.0000	*****+252.0000
*****6	*****+8.0000	*****+128.0000
*****7	*****+50.0000	*****+128.0000
*****8	*****+245.7500	*****+128.0000
*****9	*****+287.2500	*****+128.0000
*****10	*****+295.7500	*****+0.0000
*****11	*****+295.7500	*****+120.0000
*****12	*****+295.7500	*****+128.0000
*****13	*****+295.7500	*****+132.0000
*****14	*****+295.7500	*****+252.0000
*****15	*****+304.2500	*****+128.0000
*****16	*****+345.7500	*****+128.0000
*****17	*****+545.7500	*****+128.0000
*****18	*****+575.2500	*****+128.0000
*****19	*****+595.7500	*****+0.0000
*****20	*****+595.7500	*****+120.0000
*****21	*****+595.7500	*****+128.0000

INPUT DATA FROM FILE NAME 3999.PF

DATE 06-12-1990

Randy Holt & Associates  
 North-South Equivalent Frame Full Live Load  
 Seventh Floor at 517 Gold

## JOINT DATA CONTINUED

JOINT #	+,-X COORD Inch	+,-Y COORD Inch
*****22	*****+595.7500	*****+132.0000
*****23	*****+595.7500	*****+252.0000
*****24	*****+604.2500	*****+128.0000
*****25	*****+645.7500	*****+128.0000
*****26	*****+845.7500	*****+128.0000
*****27	*****+887.2500	*****+128.0000
*****28	*****+895.7500	*****+0.0000
*****29	*****+895.7500	*****+120.0000
*****30	*****+895.7500	*****+128.0000
*****31	*****+895.7500	*****+132.0000
*****32	*****+895.7500	*****+252.0000
*****33	*****+904.2500	*****+128.0000
*****34	*****+945.7500	*****+128.0000
*****35	*****+1,141.5000	*****+128.0000
*****36	*****+1,183.5000	*****+128.0000
*****37	*****+1,191.5000	*****+0.0000
*****38	*****+1,191.5000	*****+120.0000
*****39	*****+1,191.5000	*****+128.0000
*****40	*****+1,191.5000	*****+132.0000
*****41	*****+1,191.5000	*****+252.0000

## SUPPORT JOINT RESTRAINTS (translation and rotation)

0 = NO RESTRAINT  
 1 = FULL RESTRAINT

## RESTRAINTS

JOINT #	X TRANSLATION	Y TRANSLATION	Z ROTATION
*****1	**1	**1	**1
*****5	**1	**1	**1
*****10	**1	**1	**1
*****14	**1	**1	**1

INPUT DATA FROM FILE NAME 3999.PF

DATE 06-12-1990

Randy Holt & Associates  
 North-South Equivalent Frame Full Live Load  
 Seventh Floor at 517 Gold

## SUPPORT JOINT RESTRAINTS CONTINUED

## RESTRAINTS

JOINT #	X TRANSLATION	Y TRANSLATION	Z ROTATION
*****19	**1	**1	**1
*****23	**1	**1	**1
*****28	**1	**1	**1
*****32	**1	**1	**1
*****37	**1	**1	**1
*****41	**1	**1	**1

## MEMBER DATA

MEMBER #	FROM JOINT	TO JOINT	AREA OF MEMBER Sq.In.	MOD. OF ELASTICITY Ksi
*****1	*****1	*****2	*****320.0000	*****3,491.00
*****2	*****2	*****3	1,000,000.0000	*****3,491.00
*****3	*****3	*****4	1,000,000.0000	*****3,491.00
*****4	*****4	*****5	*****256.0000	*****3,491.00
*****5	*****3	*****6	****2,800.0000	*****3,122.00
*****6	*****6	*****7	****2,800.0000	*****3,122.00
*****7	*****7	*****8	****2,400.0000	*****3,122.00
*****8	*****8	*****9	****2,800.0000	*****3,122.00
*****9	*****9	*****12	****2,800.0000	*****3,122.00
*****10	*****10	*****11	****289.0000	*****3,491.00
*****11	*****11	*****12	1,000,000.0000	*****3,491.00
*****12	*****12	*****13	1,000,000.0000	*****3,491.00
*****13	*****13	*****14	*****196.0000	*****3,491.00
*****14	*****12	*****15	****2,800.0000	*****3,122.00
*****15	*****15	*****16	****2,800.0000	*****3,122.00
*****16	*****16	*****17	****2,400.0000	*****3,122.00
*****17	*****17	*****18	****2,800.0000	*****3,122.00
*****18	*****18	*****21	****2,800.0000	*****3,122.00
*****19	*****19	*****20	****289.0000	*****3,491.00
*****20	*****20	*****21	1,000,000.0000	*****3,491.00
*****21	*****21	*****22	1,000,000.0000	*****3,491.00

INPUT DATA FROM FILE NAME 3999.PF

DATE 06-12-1990

Randy Holt & Associates  
 North-South Equivalent Frame Full Live Load  
 Seventh Floor at 517 Gold

## MEMBER DATA CONTINUED

MEMBER #	FROM JOINT	TO JOINT	AREA OF MEMBER Sq.In.	MOD. OF ELASTICITY ksi
*****22	*****22	*****23	*****196.0000	*****3,491.00
*****23	*****21	*****24	****2,800.0000	*****3,122.00
*****24	*****24	*****25	****2,800.0000	*****3,122.00
*****25	*****25	*****26	****2,400.0000	*****3,122.00
*****26	*****26	*****27	****2,800.0000	*****3,122.00
*****27	*****27	*****30	****2,800.0000	*****3,122.00
*****28	*****28	*****29	*****289.0000	*****3,491.00
*****29	*****29	*****30	1,000,000.0000	*****3,491.00
*****30	*****30	*****31	1,000,000.0000	*****3,491.00
*****31	*****31	*****32	*****196.0000	*****3,491.00
*****32	*****30	*****33	****2,800.0000	*****3,122.00
*****33	*****33	*****34	****2,800.0000	*****3,122.00
*****34	*****34	*****35	****2,400.0000	*****3,122.00
*****35	*****35	*****36	****2,800.0000	*****3,122.00
*****36	*****36	*****39	****2,800.0000	*****3,122.00
*****37	*****37	*****38	*****320.0000	*****3,491.00
*****38	*****38	*****39	1,000,000.0000	*****3,491.00
*****39	*****39	*****40	1,000,000.0000	*****3,491.00
*****40	*****40	*****41	*****256.0000	*****3,491.00

## MEMBER PROPERTIES

MEMBER #                    MOMENT OF INERTIA (Iz)  
 In ^ 4

*****1	*****1,671.000
*****2	*1,000,000.000
*****3	*1,000,000.000
*****4	*****1,337.000
*****5	****27,510.000
*****6	****25,676.000
*****7	****12,800.000
*****8	****25,676.000
*****9	****27,510.000
*****10	*****3,158.000

INPUT DATA FROM FILE NAME 3999.PF

DATE 06-12-1990

Randy Holt & Associates  
North-South Equivalent Frame Full Live Load  
Seventh Floor at 517 Gold

## MEMBER PROPERTIES CONTINUED

MEMBER #            MOMENT OF INERTIA (Iz)  
                      In ^ 4

*****11	*1,000,000.000
*****12	*1,000,000.000
*****13	*****1,452.000
*****14	****27,510.000
*****15	****25,676.000
*****16	****12,800.000
*****17	****25,676.000
*****18	****27,510.000
*****19	****3,158.000
*****20	*1,000,000.000
*****21	*1,000,000.000
*****22	*****1,452.000
*****23	****27,510.000
*****24	****25,676.000
*****25	****12,800.000
*****26	****25,676.000
*****27	****27,510.000
*****28	****3,158.000
*****29	*1,000,000.000
*****30	*1,000,000.000
*****31	*****1,452.000
*****32	****27,510.000
*****33	****25,676.000
*****34	****12,800.000
*****35	****25,676.000
*****36	****27,510.000
*****37	*****1,671.000
*****38	*1,000,000.000
*****39	*1,000,000.000
*****40	*****1,337.000

INPUT DATA FROM FILE NAME 3999.PF

DATE 06-12-1990

Randy Holt & Associates  
 North-South Equivalent Frame Full Live Load  
 Seventh Floor at 517 Gold

## MEMBER DISTRIBUTED LOADS

LG = -1 IF THE FORCE COMPONENTS ARE IN THE GLOBAL COORDINATE SYSTEM AND ARE EXPRESSED AS FORCE PER UNIT LENGTH PROJECTED ON THE GLOBAL AXIS.

LG = 0 IF THE FORCE COMPONENTS ARE IN THE LOCAL MEMBER COORDINATE SYSTEM AND ARE EXPRESSED AS FORCE PER UNIT LENGTH PROJECTED ON THE LOCAL MEMBER X - AXIS.

LG = +1 IF THE FORCE COMPONENTS ARE IN THE GLOBAL COORDINATE SYSTEM AND ARE EXPRESSED AS FORCE PER UNIT LENGTH ALONG THE LOCAL MEMBER X - AXIS.

MEMBER #	X COMPONENT AT START JT Kips	X COMPONENT AT END JT Kips	Y COMPONENT AT START JT Kips	Y COMPONENT AT END JT Kips	LG#
*****5	*****+0.0000	*****+0.0000	*****-0.5562	*****-0.5562	*--
*****6	*****+0.0000	*****+0.0000	*****-0.5562	*****-0.5562	*--
*****7	*****+0.0000	*****+0.0000	*****-0.5562	*****-0.5562	*--
*****8	*****+0.0000	*****+0.0000	*****-0.5562	*****-0.5562	*--
*****9	*****+0.0000	*****+0.0000	*****-0.5562	*****-0.5562	*--
****32	*****+0.0000	*****+0.0000	*****-0.5562	*****-0.5562	*--
****33	*****+0.0000	*****+0.0000	*****-0.5562	*****-0.5562	*--
****34	*****+0.0000	*****+0.0000	*****-0.5562	*****-0.5562	*--
****35	*****+0.0000	*****+0.0000	*****-0.5562	*****-0.5562	*--
****36	*****+0.0000	*****+0.0000	*****-0.5562	*****-0.5562	*--
****14	*****+0.0000	*****+0.0000	*****-0.7681	*****-0.7681	*--
****15	*****+0.0000	*****+0.0000	*****-0.7681	*****-0.7681	*--
****16	*****+0.0000	*****+0.0000	*****-0.7681	*****-0.7681	*--
****17	*****+0.0000	*****+0.0000	*****-0.7681	*****-0.7681	*--
****18	*****+0.0000	*****+0.0000	*****-0.7681	*****-0.7681	*--
****23	*****+0.0000	*****+0.0000	*****-0.7681	*****-0.7681	*--
****24	*****+0.0000	*****+0.0000	*****-0.7681	*****-0.7681	*--
****25	*****+0.0000	*****+0.0000	*****-0.7681	*****-0.7681	*--
****26	*****+0.0000	*****+0.0000	*****-0.7681	*****-0.7681	*--
****27	*****+0.0000	*****+0.0000	*****-0.7681	*****-0.7681	*--

INPUT DATA FROM FILE NAME 3999.PF

DATE 06-12-1990

Randy Holt & Associates  
North-South Equivalent Frame Full Live Load  
Seventh Floor at 517 Gold

MEMBER CONCENTRATED LOADS

LG = 0 IF THE FORCE COMPONENTS ARE IN THE  
LOCAL MEMBER COORDINATE SYSTEM.

LG = 1 IF THE FORCE COMPONENTS ARE IN THE  
GLOBAL COORDINATE SYSTEM.

MEMBER #	DISTANCE TO LOAD Inch	X COMPONENT OF FORCE Kips	Y COMPONENT OF FORCE Kips	LG#
*****8	*****+24.2500	*****+0.000	*****-10.625	**1
****16	*****+34.0000	*****+0.000	*****-37.471	**1
****33	*****+21.5000	*****+0.000	*****-10.625	**1

END OF DATA INPUT

## PRESS CALCULATION RESULTS FOR FILE NAME 3999.PF

DATE 06-12-1990

Randy Holt & Associates  
 North-South Equivalent Frame Full Live Load  
 Seventh Floor at 517 Gold

## UNITS USED THROUGHOUT ANALYSIS

Moment : Kip-In  
 Coordinates : Inch  
 Member Weight : Lbs./ Ft.  
 Moment of Inertia : In ^ 4  
 Cross Sectional Area : Sq.In.  
 Modulus of Elasticity : Ksi

Applied Load or Force Transmitted : Kips  
 Displacement of Neutral Axis or Support : Inch  
 Rotation of Support Joint : Radian

## JOINT DISPLACEMENTS

JOINT #	+,-X DISP Inch	+,-Y DISP Inch	+,-Z ROT. Radian
1	+0.0000	+0.0000	+0.00000
2	-0.0227	-0.0038	-0.00341
3	+0.0046	-0.0038	-0.00342
4	+0.0182	-0.0038	-0.00341
5	+0.0000	+0.0000	+0.00000
6	+0.0046	-0.0316	-0.00352
7	+0.0046	-0.1811	-0.00343
8	+0.0045	-0.0492	+0.00182
9	+0.0045	-0.0124	-0.00037
10	+0.0000	+0.0000	+0.00000
11	-0.0037	-0.0182	-0.00102
12	+0.0045	-0.0182	-0.00103
13	+0.0086	-0.0182	-0.00102
14	+0.0000	+0.0000	+0.00000
15	+0.0045	-0.0301	-0.00173
16	+0.0045	-0.1532	-0.00377
17	+0.0044	-0.1220	+0.00317
18	+0.0043	-0.0438	+0.00196
19	+0.0000	+0.0000	+0.00000
20	+0.0088	-0.0170	+0.00055
21	+0.0043	-0.0170	+0.00055
22	+0.0021	-0.0170	+0.00055

## STRESS CALCULATION RESULTS FOR FILE NAME 3999.PF

DATE 06-12-1990

Randy Holt & Associates  
 North-South Equivalent Frame Full Live Load  
 Seventh Floor at 517 Gold

## JOINT DISPLACEMENTS CONTINUED

JOINT #	+, -X DISP Inch	+, -Y DISP Inch	+, -Z ROT. Radian
23	+0.0000	+0.0000	+0.00000
24	+0.0043	-0.0150	-0.00007
25	+0.0043	-0.0648	-0.00200
26	+0.0043	-0.0758	+0.00213
27	+0.0043	-0.0168	+0.00039
28	+0.0000	+0.0000	+0.00000
29	+0.0027	-0.0159	-0.00019
30	+0.0042	-0.0159	-0.00019
31	+0.0050	-0.0159	-0.00019
32	+0.0000	+0.0000	+0.00000
33	+0.0042	-0.0201	-0.00078
34	+0.0042	-0.0975	-0.00264
35	+0.0042	-0.2069	+0.00396
36	+0.0042	-0.0356	+0.00401
37	+0.0000	+0.0000	+0.00000
38	+0.0352	-0.0040	+0.00388
39	+0.0042	-0.0040	+0.00388
40	-0.0114	-0.0040	+0.00388
41	+0.0000	+0.0000	+0.00000

## MEMBER END LOADS

AT JOINT #'S LABELED \* POSITIVE AXIAL FORCE VALUE = TENSION FORCE

MEMBER #	JOINT #	AXIAL FORCE Kips	SHEAR FORCE Kips	MOMENT Kip-In
1	1	+35.61	-9.22	-387.14
	2*	-35.61	+9.22	-719.01
2	2	+35.66	-9.22	+719.14
	3*	-35.66	+9.22	-792.90

## PRESS CALCULATION RESULTS FOR FILE NAME 3999.PF

DATE 06-12-1990

Randy Holt & Associates  
 North-South Equivalent Frame Full Live Load  
 Seventh Floor at 517 Gold

## MEMBER END LOADS CONTINUED

AT JOINT #'S LABELED \* POSITIVE AXIAL FORCE VALUE = TENSION FORCE

MEMBER #	JOINT #	AXIAL FORCE Kips	SHEAR FORCE Kips	MOMENT Kip-In
3	3	-28.25	-7.32	-597.82
	4*	+28.25	+7.32	+568.56
4	4	-28.49	-7.23	-566.68
	5*	+28.49	+7.23	-301.07
5	3	+1.70	+63.78	+1390.88
	6*	-1.70	-59.33	-898.40
6	6	+1.70	+59.33	+898.40
	7*	-1.70	-35.97	+1102.91
7	7	+1.70	+35.97	-1102.92
	8*	-1.70	+72.92	-2513.34
8	8	+1.70	-72.92	+2513.34
	9*	-1.70	+106.63	-6201.68
9	9	+1.70	-106.63	+6201.68
	12*	-1.70	+111.35	-7128.10
10	10	+153.38	-4.99	-205.11
	11*	-153.38	+4.99	-393.28
11	11	+153.62	-5.03	+393.30
	12*	-153.62	+5.03	-433.53
12	12	-104.04	-2.44	-201.37
	13*	+104.04	+2.44	+191.62
13	13	-104.03	-2.47	-191.33
	14*	+104.03	+2.47	-104.75
14	12	+4.44	+144.34	+7763.30
	15*	-4.44	-137.81	-6564.17

## PRESS CALCULATION RESULTS FOR FILE NAME 3999.PF

DATE 06-12-1990

Randy Holt & Associates  
 North-South Equivalent Frame Full Live Load  
 Seventh Floor at 517 Gold

## MEMBER END LOADS CONTINUED

AT JOINT #'S LABELED \* POSITIVE AXIAL FORCE VALUE = TENSION FORCE

MEMBER #	JOINT #	AXIAL FORCE Kips	SHEAR FORCE Kips	MOMENT Kip-In
15	15	+4.44	+137.81	+6564.16
	16*	-4.44	-105.93	-1506.48
16	16	+4.44	+105.93	+1506.48
	17*	-4.44	+85.15	-1901.49
17	17	+4.44	-85.15	+1901.49
	18*	-4.44	+107.81	-4747.73
18	18	+4.44	-107.81	+4747.73
	21*	-4.44	+123.56	-7119.29
19	19	+143.00	+3.21	+141.80
	20*	-143.00	-3.21	+243.35
20	20	+143.05	+3.24	-243.54
	21*	-143.05	-3.24	+269.45
21	21	-97.54	+0.99	+92.97
	22*	+97.54	-0.99	-89.00
22	22	-96.98	+1.09	+88.98
	23*	+96.98	-1.09	+42.25
23	21	+2.34	+116.68	+6756.53
	24*	-2.34	-110.15	-5792.48
24	24	+2.34	+110.16	+5792.47
	25*	-2.34	-78.28	-1882.41
25	25	+2.34	+78.28	+1882.40
	26*	-2.34	+75.34	-1587.92
26	26	+2.34	-75.34	+1587.92
	27*	-2.34	+107.21	-5375.78

## STRESS CALCULATION RESULTS FOR FILE NAME 3999.PF

DATE 06-12-1990

Pandy Holt & Associates  
 North-South Equivalent Frame Full Live Load  
 Seventh Floor at 517 Gold

## MEMBER END LOADS CONTINUED

AT JOINT #'S LABELED \* POSITIVE AXIAL FORCE VALUE = TENSION FORCE

MEMBER #	JOINT #	AXIAL FORCE Kips	SHEAR FORCE Kips	MOMENT Kip-In
27	27	+2.34	-107.21	+5375.79
	30*	-2.34	+113.74	-6314.82
28	28	+133.29	-0.67	-22.54
	29*	-133.29	+0.67	-57.59
29	29	+133.30	-0.67	+57.52
	30*	-133.30	+0.67	-62.89
30	30	-91.03	-0.55	-45.82
	31*	+91.03	+0.55	+43.61
31	31	-90.40	-0.58	-42.83
	32*	+90.40	+0.58	-26.71
32	30	+2.58	+108.16	+6423.53
	33*	-2.58	-103.43	-5524.29
33	33	+2.58	+103.43	+5524.27
	34*	-2.58	-69.72	-1923.40
34	34	+2.58	+69.72	+1923.40
	35*	-2.58	+39.16	+1067.28
35	35	+2.58	-39.17	-1067.28
	36*	-2.58	+62.53	-1068.26
36	36	+2.58	-62.53	+1068.25
	39*	-2.58	+66.98	-1586.31
37	37	+37.09	+10.86	+462.93
	38*	-37.09	-10.86	+840.27
38	38	+37.19	+10.82	-840.65
	39*	-37.19	-10.82	+927.22